



PROTON-ELECTROTEX
Power semiconductor devices

P r o d u c t c a t a l o g

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Letter symbols for thyristors

V_{DRM} V_{RRM}	Repetitive peak off-state and reverse voltage
I_{TAV}	Mean on-state current
I_{TRMS}	RMS on-state current
I_{TSM}	Surge on-state current
T_j	Junction temperature
T_{stg}	Storage temperature
T_c	Case temperature
M	Tightening torque
F	Mountain force
V_{TM}	Peak on-state voltage
$V_{T(TO)}$	Threshold voltage
r_T	On-state slope resistance
I_{RRM} I_{DRM}	Repetitive peak reverse and off-state current
U_{GT}	Gate trigger direct voltage
I_{GT}	Gate trigger direct current
$(dv_D/dt)_{crit}$	Critical rate of rise of off-state voltage
$(di_T/dt)_{crit}$	Critical rate of rise of on-state current
t_q	Turn-off time
R_{thjc}	Thermal resistance junction to case

Letter symbols for diodes

V_{RRM}	Repetitive peak reverse voltage
I_{FAV}	Mean forward current
I_{FRMS}	RMS forward current
I_{FSM}	Surge forward current
T_j	Junction temperature
T_{stg}	Storage temperature
T_c	Case temperature
M	Tightening torque
F	Mountain force
V_{FM}	Peak forward voltage
$V_{(TO)}$	Threshold voltage
r_T	Slope resistance
I_{RRM}	Repetitive peak reverse current
P_{RSM}	Surge reverse power dissipation
R_{thjc}	Thermal resistance junction to case
t_{rr}	Reverse recovery time

du/dt value code

Symbol of group	0	P3	E3	A3	P2	K2	E2	A2	T1	P1	M1	K1	H1	E1	C1	B1
	0	1	2	3	4	5	6	7	8	–	9	–	–	–	–	–
$(dv_D/dt)_{crit}$ $V/\mu s$	Not limited	20	50	100	200	320	500	1000	1600	2000	2500	3200	4000	5000	6300	8000

t_q value code for phase control thyristors

Symbol of group	0	B2	C2	E2	H2	K2	M2	P2	T2	X2	A3	B3
	0	–	–	1	–	–	2	–	3	–	4	–
$t_q, \mu s$	Not limited	800	630	500	400	320	250	200	160	125	100	80

t_q value code for fast thyristors

Symbol of group	C3	E3	H3	K3	M3	P3	T3	X3	A4	B4	C4	E4
	1	2	3	4	5	6	7	8	–	9	–	–
$t_q, \mu s$	63	50	40	32	25	20	16	12,5	10	8	6,3	5

t_{rr} value code for fast recovery diodes

Symbol of group	0	T3	X3	A4	B4	C4	E4	H4	K4	M4	P4	T4	X4	A5	B5	C5	E5	H5
	0	–	–	–	–	–	1	2	3	4	5	6	–	7	–	8	–	9
$t_{rr}, \mu s$	Not limited	16	12,5	10	8	6,3	5	4	3,2	2,5	2	1,6	1,25	1	0,8	0,63	0,5	0,4

PART I

Devices in Disc Design

Main Characteristics:

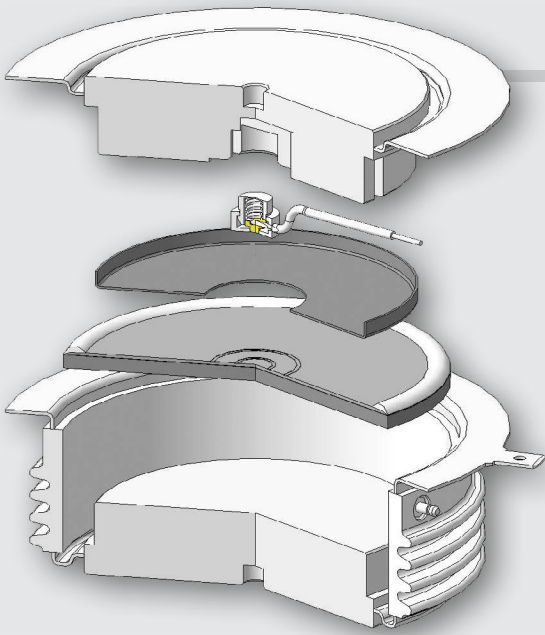
- Mean on-state and forward currents up to 7100 A.
- Blocking voltage up to 6500 V.
- High resistance to cyclic load due to pressure construction.
- Height of housing — 14, 20, 26, 35 mm.
- Diameter of semiconductor element — 24, 32, 40, 56, 70, 80, 90, 100 mm.

Optional opportunities:

- Supply of devices assembled with heat sinks.
- Selection of devices in groups for parallel, series and combined connection.
- Production of devices according to the special requirements of customers.

Application:

Power Semiconductor Disc Devices are applied in rectifying installation, softstarters, invertors, welding equipment, power supply equipment, wind-powered generator, induction heating equipment.



Overview Phase Control Thyristors in Disc Housings

6500			T643-320 T743-320	T853-500 T653-800 T953-800 T253-500	T163-1000 T363-1000	T473-1250 T673-1250	T183-1600 T383-1600	T193-2000 T393-2000
5200					T263-1000		T283-2000	T193-2500 T393-2500
4400		T933-160 T933-250	T243-400 T343-400	T553-800	T163-1250	T273-1250 T373-1250	T183-2500	T193-3200 T393-3200
3600	T123-160	T433-250	T443-500	T353-800 T453-800		T173-1600 T373-1600		T193-3600 T393-3600
2800		T133-320 T333-320	T243-500 T343-630	T353-1000	T163-1600	T173-2000 T373-2000	T183-3200	T193-4000 T393-4000
2400		T133-400 T333-400	T143-400	T253-800 T253-1390				
1800	T123-320	T233-500	T243-800 T143-800 T343-800	T253-1250 T453-1250 T353-1600	T163-2000	T173-2500 T373-2500 T273-3200	T183-4000	T193-5000 T393-5000
1000	T123-400	T133-500		T143-1000		T173-3200 T373-3200		
800	T123-500	T133-630	T143-1250	T153-2000				
Blocking voltage [V] ∅ of the element [mm]	24	32	40	56	70	80	90	100

Overview Fast Thyristors in Disc Housings

4000						TFI473-1600 • TFI873-1600
3600	TFI933-250					
3400					TFI353-800	
3000					TFI353-700	
2800					TFI353-1000	TFI373-1600 • TFI773-1600
2500						TFI373-2000 • TFI773-2000
2400	TFI233-320 • TFI333-320 TFI233-400					
2200			TFI243-400 • TFI443-400 TFI643-400 • TFI243-500 TFI443-500 • TFI643-500 TFI243-630 • TFI443-630		TFI253-800 • TFI253-1000 TFI253-1250	
2000						TFI673-2000 • TFI273-2000
1500	TFI333-400 • TFI533-400		TFI143-400 • TFI343-400 TFI543-400 • TFI143-500 TFI343-500 • TFI543-500 TFI143-630 • TFI343-630 TFI543-630		TFI153-800 • TFI153-1000 TFI153-1250	
1400	TFIS123-200					TFIS153-800 • TFIS153-1000
1200	TFI133-400 • TFI433-400		TFIS133-400		TFIS343-500	TFI573-2000 • TFI173-2000
1100					TFIS143-500	
Blocking voltage [V] ∅ of the element [mm]	32		40		56	80

Part numbering guide

TFI	133	-	400	-	12	-	A2	A4	-	N
1	2		3		4		5	6		7

1. T — Phase Control / TFI — Fast Thyristor / TFIS — Ultra Fast Thyristor
2. Design version
3. Mean on-state current, A
4. Voltage code
5. Critical rate of rise of off-state voltage
6. Group of turn-off time
7. Ambient conditions: N - normal; T - tropical

Phase Control Thyristors

Part Number	Ø of the element	V_{DRM}^{RRM}	I_{TSM}	I_{TAV}	V_{TM}	I_{TM}	$V_{T(TO)}$	r_T	t_q	T_{jmax}	R_{thjc}	Package	Recommended Heatsinks
		[V]	[kA]	[T _c , °C]	[V]	[A]	[V]	[mΩ]	[μs]	[°C]	[°C/W]		
up to 800 V													
T123-500	24	100÷800	6,0	500 (100)	1,55	1570	0,80	0,490	80	150	0,0700	T.A1	0123
T133-630	32	100÷800	12,0	630 (116)	1,45	1978	0,80	0,340	125	150	0,0400	T.B2	0143, 0243, 0343
T143-1250	40	100÷800	30,0	1250 (100)	1,50	3925	0,80	0,170	160	150	0,0300	T.C1	0143, 0243, 0343
T153-2000	56	100÷800	45,0	2000 (90)	1,45	6280	0,80	0,120	160	140	0,0180	T.D1	0153, 0253
up to 1000 V													
T123-400	24	800÷1000	5,5	400 (110)	1,65	1256	0,83	0,580	125	150	0,0700	T.A1	0123
T133-500	32	800÷1000	10,0	500 (120)	1,50	1570	0,95	0,420	125	150	0,0400	T.B2	0143, 0243, 0343
T143-1000	40	800÷1000	19,0	1000 (104)	1,50	3140	0,85	0,270	160	150	0,0300	T.C1	0143, 0243, 0343
T173-3200	80	800÷1000	65,0	3200 (104)	1,50	10048	0,83	0,062	250	140	0,0085	T.F2	0173
T373-3200	80	800÷1000	60,0	3200 (98)	1,50	10048	0,83	0,062	250	140	0,0100	T.F5	0173
up to 1800 V													
T123-320	24	1000÷1800	5,0	320 (89)	1,75	1005	0,90	0,850	125	125	0,0700	T.A1	0123
T233-500	32	1000÷1600	8,5	500 (93)	1,70	1570	0,95	0,510	125	125	0,0400	T.B2	0143, 0243, 0343
T243-800	40	1000÷1800	16,0	800 (85)	1,70	2512	1,00	0,330	160	125	0,0300	T.C1	0143, 0243, 0343
T143-800	40	1000÷1800	16,0	800 (82)	1,70	2512	1,00	0,330	160	125	0,0320	T.C2	0143, 0243, 0343
T343-800	40	1000÷1800	17,5	800 (89)	1,50	1570	0,85	0,320	200	130	0,0350	T.C3	0143, 0243, 0343
T453-1250	56	1000÷1800	24,0	1250 (90)	1,80	3925	0,95	0,200	160	125	0,0180	T.D5	0153, 0253
T253-1250	56	1000÷1800	28,0	1250 (90)	1,60	3925	0,95	0,200	200	125	0,0180	T.D5	0153, 0253
T353-1600	56	1000÷1800	28,0	1600 (83)	1,60	5024	0,80	0,165	160	125	0,0180	T.D5	0153, 0253
T163-2000	70	1000÷1800	44,0	2000 (96)	1,45	5000	0,85	0,120	250	125	0,0100	T.E3	0173
T173-2500	80	1000÷1800	54,0	2500 (94)	1,55	7850	0,88	0,092	250	125	0,0085	T.F2	0173
T373-2500	80	1000÷1800	50,0	2500 (89)	1,55	7850	0,88	0,092	250	125	0,0100	T.F5	0173
T273-3200	80	1600÷1800	57,0	3200 (85)	1,50	7850	0,81	0,084	250	125	0,0085	T.F2	0173
T183-4000	90	1000÷1800	70,0	4000 (82)	1,35	6300	0,85	0,080	320	125	0,0065	T.H1	0173
T193-5000	100	1000÷1800	94,0	5000 (84)	1,30	6300	0,90	0,060	400	125	0,0050	T.G5	0193
T393-5000	100	1000÷1800	94,0	5000 (78)	1,30	6300	0,90	0,060	400	125	0,0057	T.G6	0193
up to 2400 V													
T133-400	32	2000÷2400	7,0	400 (87)	2,10	1256	1,10	1,250	200	125	0,0400	T.B3	0143, 0243, 0343
T333-400	32	2000÷2400	7,0	400 (87)	2,10	1256	1,10	1,250	200	125	0,0400	T.B2	0143, 0243, 0343
T143-400	40	2000÷2400	9,0	400 (97)	2,15	1256	1,20	0,950	250	125	0,0320	T.C2	0143, 0243, 0343
T253-800	56	2000÷2400	17,0	800 (95)	2,10	2512	1,20	0,440	320	125	0,0180	T.D5	0153, 0253
T253-1390	56	2000÷2400	24,5	1390 (85)	1,50	3140	0,85	0,220	160	125	0,0180	T.D5	0153, 0253
up to 2800 V													
T133-320	32	2000÷2800	6,5	320 (95)	2,10	1005	1,15	1,500	200	125	0,0400	T.B3	0143, 0243, 0343
T333-320	32	2000÷2800	6,5	320 (95)	2,10	1005	1,15	1,500	200	125	0,0400	T.B2	0143, 0243, 0343
T243-500	40	2000÷2800	10,0	500 (94)	2,00	1570	1,04	0,735	250	125	0,0320	T.C2	0143, 0243, 0343
T343-630	40	2000÷2800	11,0	630 (91)	1,90	1978	1,15	0,400	250	125	0,0300	T.C1	0143, 0243, 0343
T353-1000	56	2000÷2800	20,0	1000 (88)	2,00	3140	1,10	0,380	320	125	0,0180	T.D5	0153, 0253
T163-1600	70	2000÷2800	38,0	1600 (99)	1,75	5000	0,85	0,200	400	125	0,0100	T.E3	0173
T173-2000	80	2000÷2800	50,0	2000 (99)	1,60	6280	0,90	0,130	500	125	0,0085	T.F2	0173
T373-2000	80	2000÷2800	46,0	2000 (94)	1,60	6280	0,90	0,130	500	125	0,0100	T.F5	0173
T183-3200	90	2000÷2800	60,0	3200 (87)	1,55	6300	0,90	0,115	400	125	0,0065	T.H1	0173
T193-4000	100	2000÷2800	75,0	4000 (94)	1,45	6300	0,85	0,070	500	125	0,0050	T.G5	0193
T393-4000	100	2000÷2800	75,0	4000 (90)	1,45	6300	0,85	0,070	500	125	0,0057	T.G6	0193

Phase Control Thyristors

Part Number	Ø of the element	V_{DRM}^{RRM}	I_{TSM}	I_{TAV}	V_{TM}	I_{TM}	$V_{T(TO)}$	r_T	t_q	T_{jmax}	R_{thjc}	Package	Recommended Heatsinks
		[V]	[kA]	[T_c, C°]	[V]	[A]	[V]	[mΩ]	[μs]	[$^\circ C$]	[$^\circ C/W$]		
up to 3600 V													
T123-160	24	3000÷3600	4,5	160 (97)	2,30	503	0,95	3,000	200	125	0,0800	T.A1	0123
T433-250	32	3000÷3600	6,5	250 (100)	2,50	785	1,20	2,100	250	125	0,0400	T.B3	0143, 0243, 0343
T443-500	40	3000÷3600	9,0	500 (91)	2,10	785	1,15	0,800	320	125	0,0320	T.C2	0143, 0243, 0343
T353-800	56	3000÷3600	18,0	800 (95)	2,20	2512	1,30	0,400	400	125	0,0180	T.D5	0153, 0253
T453-800	56	3000÷3600	16,0	800 (91)	2,30	2512	1,45	0,450	400	125	0,0180	T.D5	0153, 0253
T173-1600	80	3000÷3600	39,0	1600 (97)	2,05	5024	1,15	0,220	500	125	0,0085	T.F2	0173
T373-1600	80	3000÷3600	36,0	1600 (92)	2,05	5024	1,15	0,220	500	125	0,0100	T.F5	0173
T193-3600	100	3000÷3600	72,0	3600 (91)	1,70	6300	0,90	0,110	630	125	0,0050	T.G5	0193
T393-3600	100	3000÷3600	72,0	3600 (86)	1,70	6300	0,90	0,110	630	125	0,0057	T.G6	0193
up to 4400 V													
T933-160	34	3800÷4400	4,5	160 (102)	3,00	502	2,20	3,500	400	125	0,0400	T.B3	0143, 0243, 0343
T933-250	34	3800÷4400	5,0	250 (98)	2,70	785	1,30	2,300	500	125	0,0400	T.B3	0143, 0243, 0343
T243-400	40	3800÷4400	8,0	400 (92)	2,35	1256	1,30	1,250	500	125	0,0320	T.C2	0143, 0243, 0343
T343-400	40	3800÷4400	8,0	400 (89)	2,35	1256	1,30	1,250	500	125	0,0350	T.C3	0143, 0243, 0343
T553-800	56	3800÷4400	15,0	800 (89)	2,60	2512	1,20	0,650	500	125	0,0180	T.D5	0153, 0253
T163-1250	70	3800÷4400	27,0	1250 (102)	2,30	5000	1,05	0,250	630	125	0,0100	T.E3	0173
T273-1250	80	3800÷4400	36,0	1250 (102)	2,10	3925	1,20	0,300	630	125	0,0085	T.F2	0173
T373-1250	80	3800÷4400	33,0	1250 (98)	2,10	3925	1,20	0,300	630	125	0,0100	T.F5	0173
T183-2500	90	3800÷4400	50,0	2500 (88)	2,10	6300	1,00	0,210	700	125	0,0065	T.H1	0193
T193-3200	100	3800÷4400	60,0	3200 (91)	1,80	6300	0,95	0,150	800	125	0,0050	T.G5	0193
T393-3200	100	3800÷4400	60,0	3200 (86)	1,80	6300	0,95	0,150	800	125	0,0057	T.G6	0193
up to 5200 V													
T263-1000	70	4600÷5200	26,0	1000 (104)	2,80	5000	0,90	0,500	800	125	0,0100	T.E3	0173
T283-2000	90	4600÷5200	42,0	2000 (93)	2,50	6300	1,00	0,290	800	125	0,0065	T.H1	0193
T193-2500	100	4600÷5200	55,0	2500 (98)	2,10	6300	1,00	0,190	800	125	0,0050	T.G5	0193
T393-2500	100	4600÷5200	55,0	2500 (94)	2,10	6300	1,00	0,190	800	125	0,0057	T.G6	0193
up to 6500 V													
T643-320	40	4600÷6500	4,5	320 (92)	2,60	785	1,00	2,500	630	125	0,0350	T.C6	0143, 0243, 0343
T743-320	40	4600÷6500	4,5	320 (82)	2,60	785	1,00	2,500	630	125	0,0450	T.C5	0143, 0243, 0343
T253-500	56	4600÷6500	10,5	500 (102)	2,50	1570	1,10	1,200	630	125	0,0180	T.D5	0153, 0253
T853-500	56	4600÷6500	10,0	500 (99)	2,50	1570	1,05	1,200	630	125	0,0200	T.D4	0153, 0253
T653-800	56	4600÷6500	10,5	800 (79)	2,40	1500	1,05	1,100	630	125	0,0180	T.D5	0153, 0253
T953-800	56	4600÷6500	10,0	800 (73)	2,40	1500	1,05	1,100	630	125	0,0200	T.D4	0153, 0253
T163-1000	70	5400÷6500	22,0	1000 (101)	3,15	5000	1,00	0,560	800	125	0,0100	T.E3	0173
T363-1000	70	5400÷6500	22,0	1000 (98)	3,15	5000	1,00	0,560	800	125	0,0110	T.E4	0173
T473-1250	80	4600÷6500	23,0	1250 (96)	2,50	3925	1,00	0,420	800	125	0,0100	T.F5	0173
T673-1250	80	4600÷6500	25,0	1250 (100)	2,50	3925	1,00	0,420	800	125	0,0085	T.F2	0173
T183-1600	90	5400÷6500	40,0	1600 (102)	2,70	6300	1,00	0,300	800	125	0,0065	T.H1	0193
T383-1600	90	5400÷6500	40,0	1600 (98)	2,70	6300	1,00	0,320	800	125	0,0075	T.H2	0193
T193-2000	100	4600÷6500	45,0	2000 (99)	2,70	6300	1,10	0,320	800	125	0,0050	T.G5	0193
T393-2000	100	4600÷6500	45,0	2000 (95)	2,70	6300	1,10	0,300	800	125	0,0057	T.G6	0193

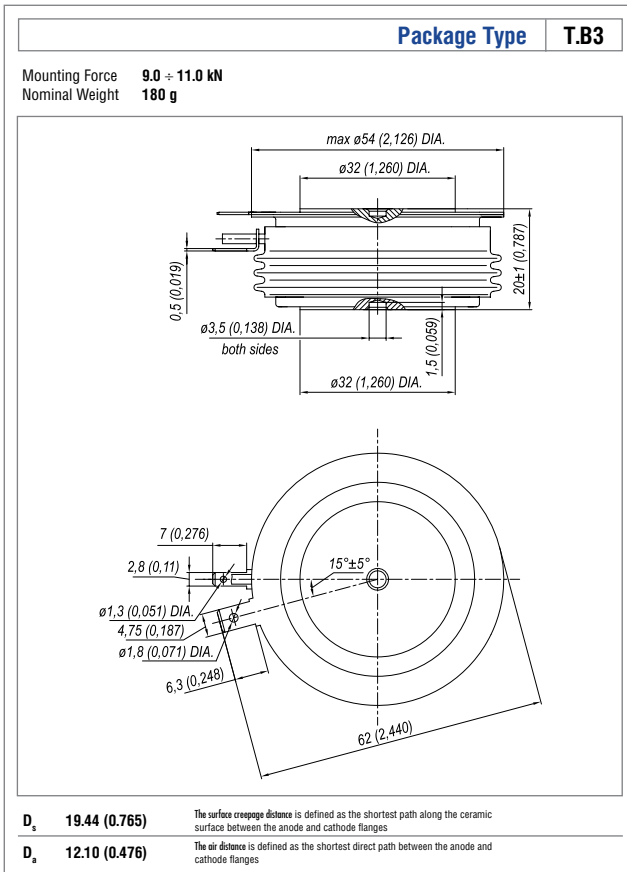
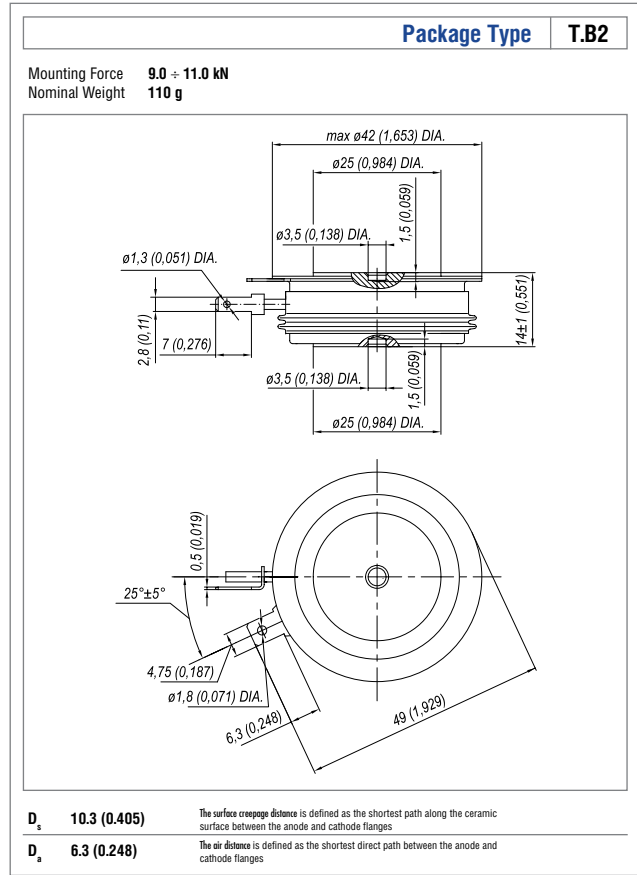
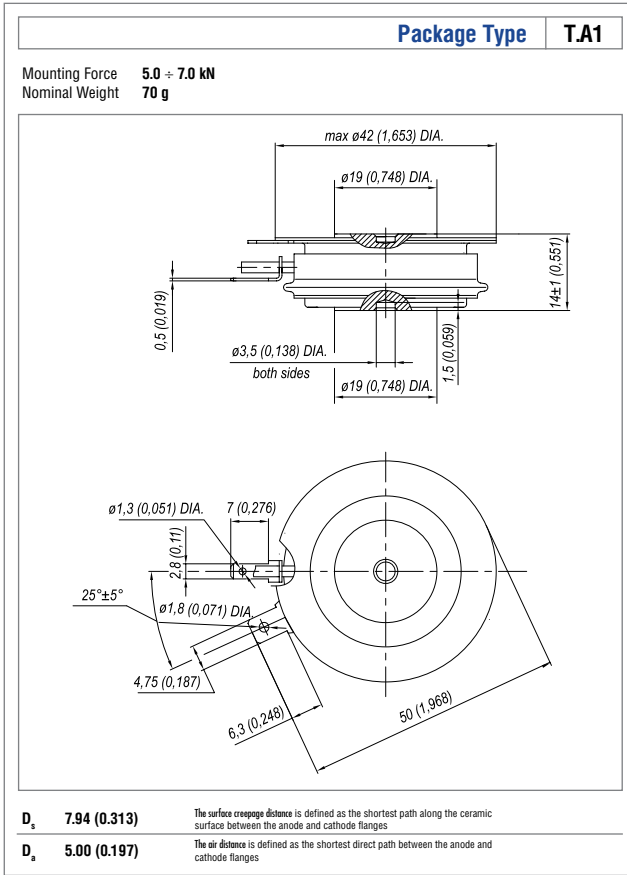
Ultra Fast Thyristors

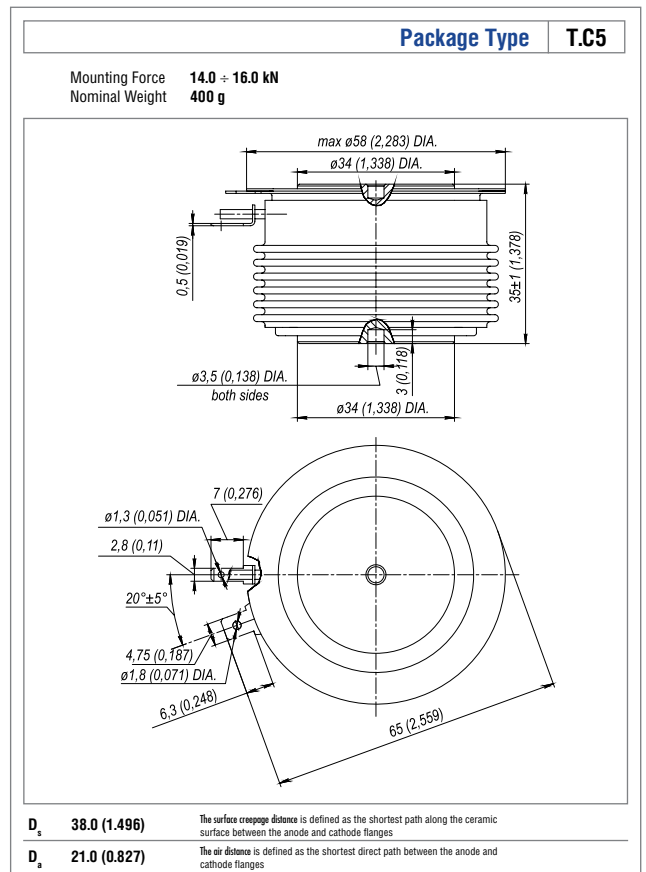
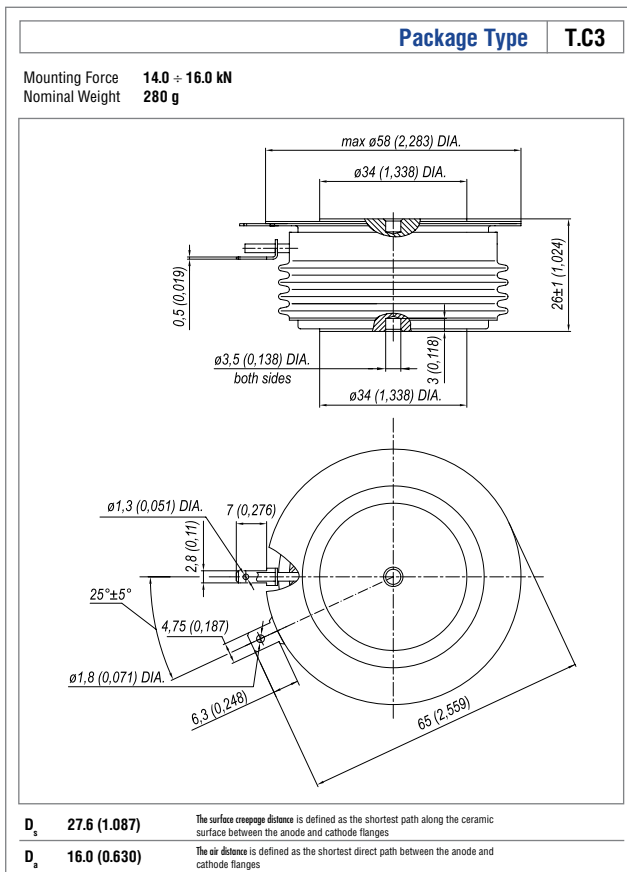
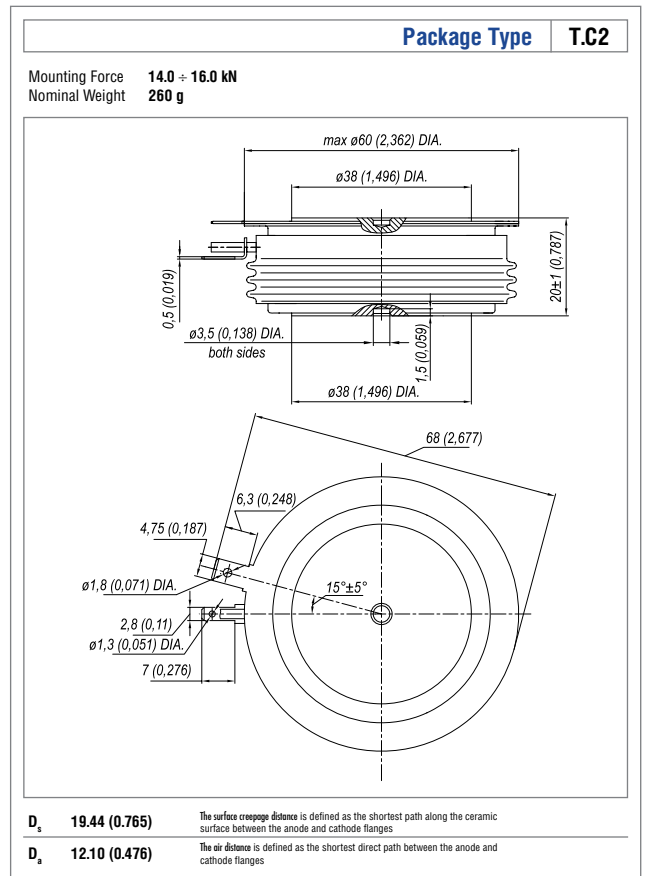
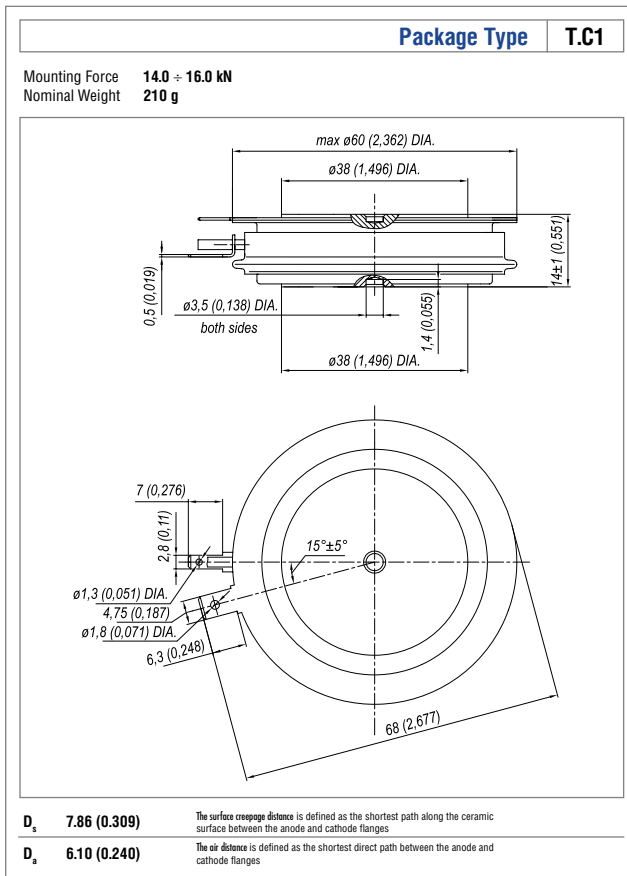
Part Number	∅ of the element	$\frac{V_{DRM}}{V_{RRM}}$	I_{TSM}	I_{TAV}	V_{TM}	I_{TM}	$V_{T(TO)}$	r_T	t_q	T_{jmax}	R_{thjc}	Package	Recommended Heatsinks
		[V]											
up to 1800 V													
TFIS123-200	24	1000÷1400	3,5	200 (83)	3,30	628	1,40	3,200	6,3	125	0,0700	T.A1	0123
TFIS133-400	32	1000÷1200	6,5	400 (81)	3,00	1256	1,80	0,950	5,0	125	0,0400	T.B2	0143, 0243, 0343
TFIS143-500	40	1000÷1100	9,0	500 (86)	2,40	1570	1,40	0,800	5,0	125	0,0320	T.C3	0143, 0243, 0343
TFIS343-500	40	1000÷1100	9,5	500 (89)	2,40	1570	1,40	0,800	5,0	125	0,0300	T.C1	0143, 0243, 0343
TFIS153-800	56	1000÷1400	18,0	800 (83)	2,60	2512	1,50	0,500	8,0	125	0,0210	T.D5	0153, 0253
TFIS153-1000	56	1000÷1400	19,0	1000 (78)	2,30	3140	1,35	0,350	10,0	125	0,0210	T.D5	0153, 0253

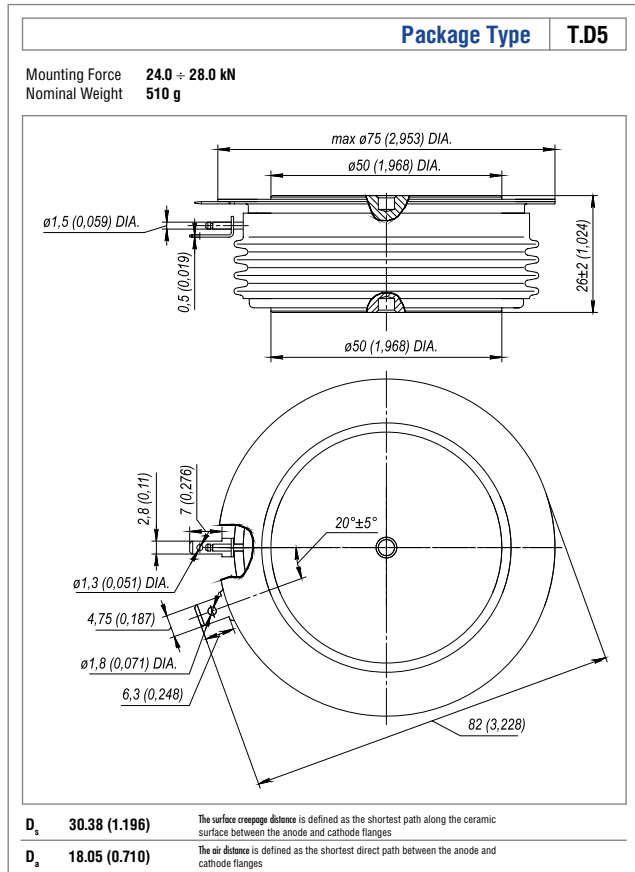
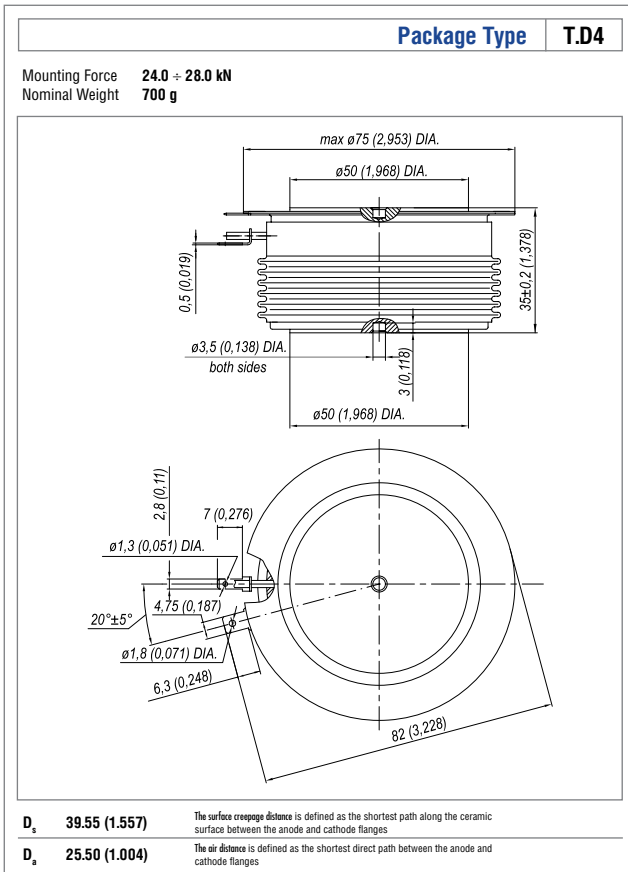
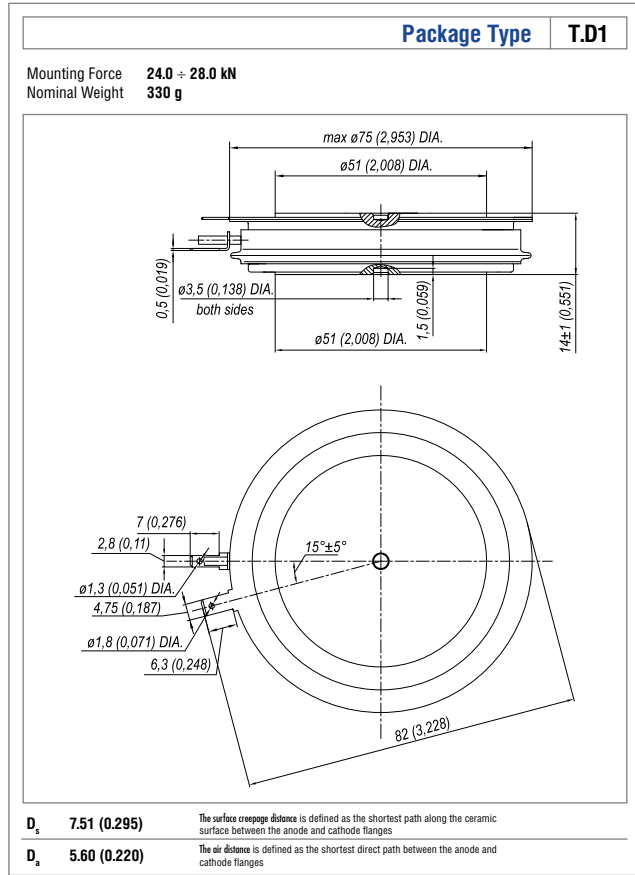
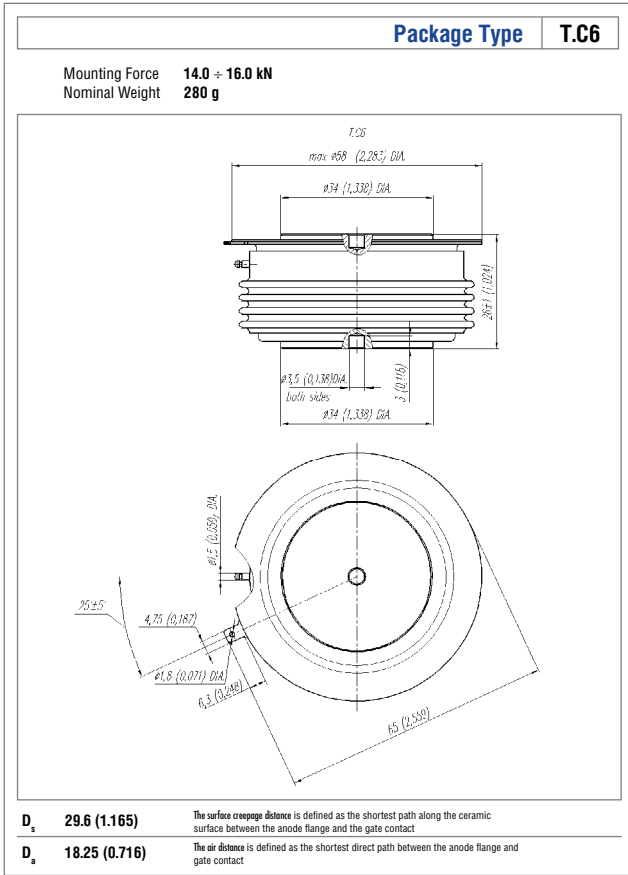
Fast Thyristors

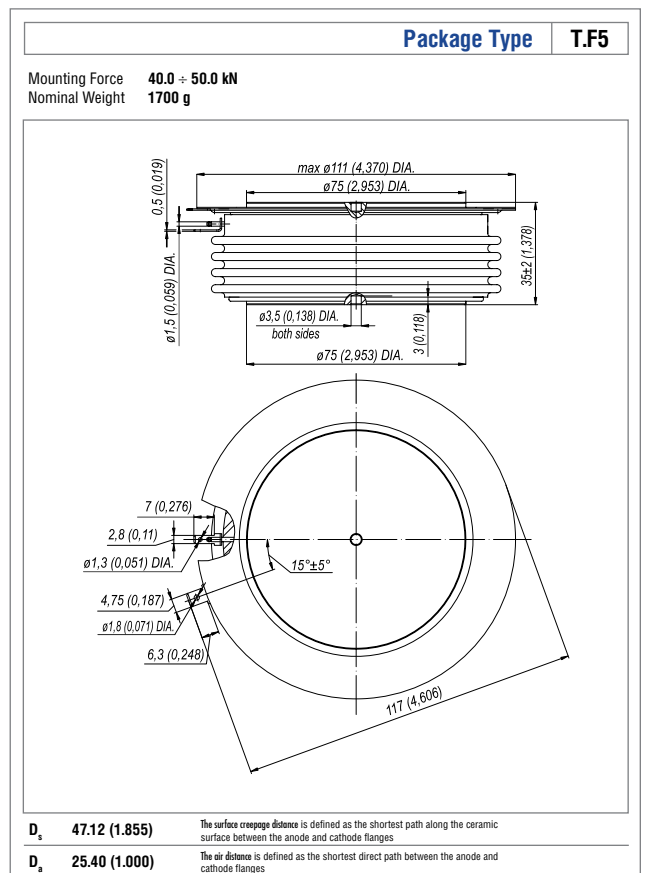
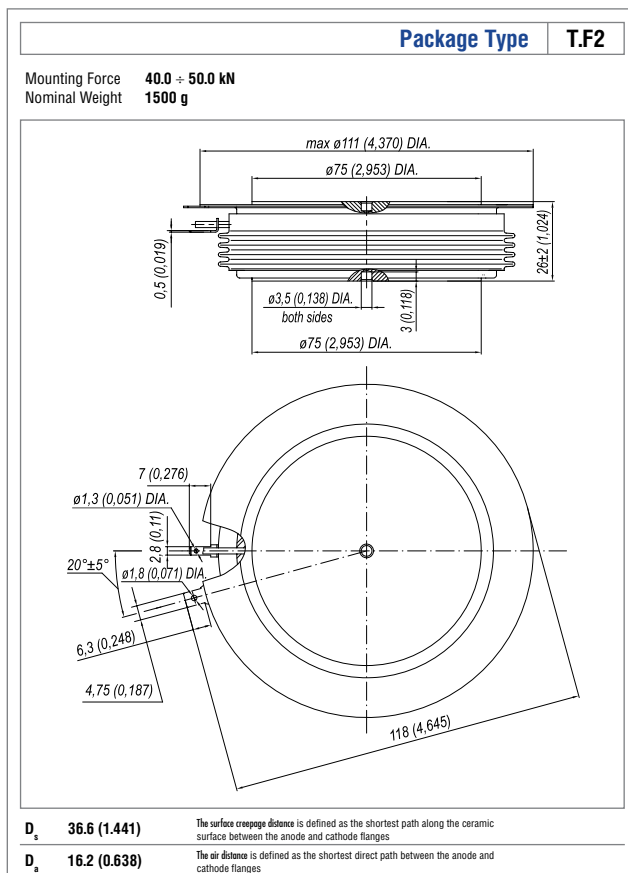
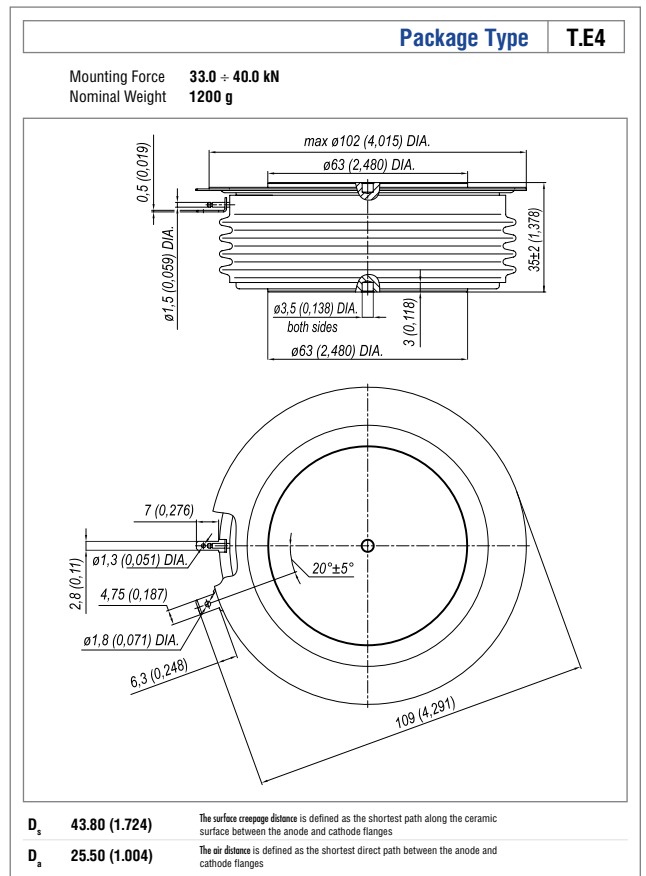
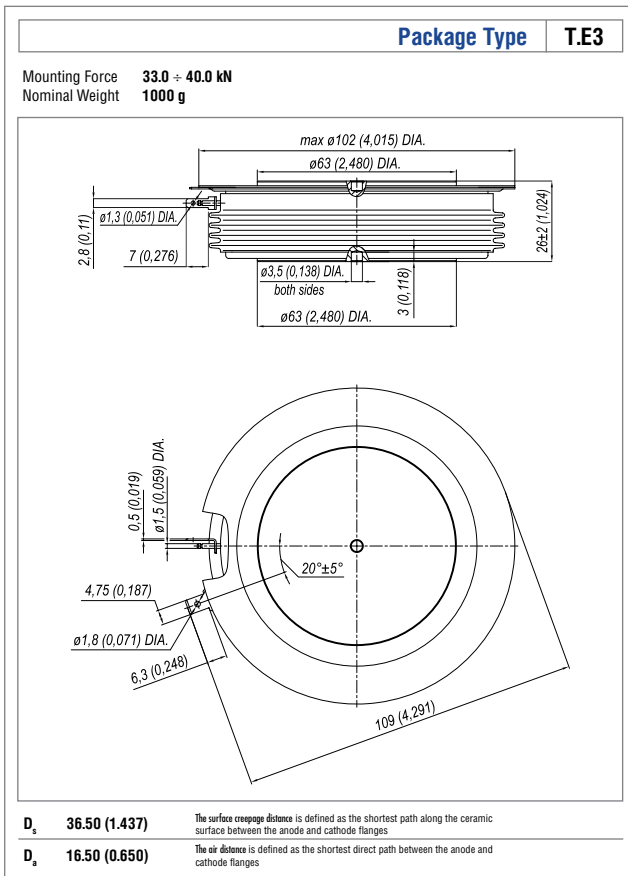
Part Number	∅ of the element	$\frac{V_{DRM}}{V_{RRM}}$	I_{TSM}	I_{TAV}	V_{TM}	I_{TM}	$V_{T(TO)}$	r_T	t_q	T_{jmax}	R_{thjc}	Package	Recommended Heatsinks
		[V]											
up to 1200 V													
TFI133-400	32	1000÷1200	7,0	400 (90)	2,40	1256	1,35	0,850	10,0	125	0,0400	T.B2	0143, 0243, 0343
TFI433-400	32	1000÷1200	7,0	400 (90)	2,40	1256	1,35	0,850	10,0	125	0,0400	T.B3	0143, 0243, 0343
TFI573-2000	80	1000÷1200	52,0	2000 (94)	2,15	6280	1,40	0,080	10,0	125	0,0085	T.F2	0173
TFI173-2000	80	1000÷1200	48,5	2000 (89)	2,15	6280	1,40	0,080	10,0	125	0,0100	T.F5	0173
up to 1500 V													
TFI333-400	32	1000÷1500	7,0	400 (90)	2,40	1256	1,35	0,850	16,0	125	0,0400	T.B2	0143, 0243, 0343
TFI533-400	32	1000÷1500	7,0	400 (90)	2,40	1256	1,35	0,850	16,0	125	0,0400	T.B3	0143, 0243, 0343
TFI143-400	40	1000÷1500	8,0	400 (90)	2,85	1256	1,50	1,250	10,0	125	0,0320	T.C3	0143, 0243, 0343
TFI343-400	40	1000÷1500	8,5	400 (92)	2,85	1256	1,50	1,250	10,0	125	0,0300	T.C1	0143, 0243, 0343
TFI543-400	40	1000÷1500	8,0	400 (90)	2,85	1256	1,50	1,250	10,0	125	0,0320	T.C2	0143, 0243, 0343
TFI143-500	40	1000÷1500	9,0	500 (86)	2,40	1570	1,40	0,800	12,5	125	0,0320	T.C3	0143, 0243, 0343
TFI343-500	40	1000÷1500	9,5	500 (89)	2,40	1570	1,40	0,800	12,5	125	0,0300	T.C1	0143, 0243, 0343
TFI543-500	40	1000÷1500	9,0	500 (86)	2,40	1570	1,40	0,800	12,5	125	0,0320	T.C2	0143, 0243, 0343
TFI143-630	40	1000÷1500	10,0	630 (80)	2,30	1978	1,20	0,650	16,0	125	0,0320	T.C3	0143, 0243, 0343
TFI343-630	40	1000÷1500	10,5	630 (83)	2,30	1978	1,20	0,650	16,0	125	0,0300	T.C1	0143, 0243, 0343
TFI543-630	40	1000÷1500	10,0	630 (80)	2,30	1978	1,20	0,650	16,0	125	0,0320	T.C2	0143, 0243, 0343
TFI153-800	56	1000÷1500	19,0	800 (85)	2,50	2512	1,40	0,490	10,0	125	0,0210	T.D5	0153, 0253
TFI153-1000	56	1000÷1500	20,0	1000 (80)	2,25	3140	1,30	0,340	12,5	125	0,0210	T.D5	0153, 0253
TFI153-1250	56	1000÷1500	21,0	1250 (70)	2,10	3925	1,20	0,290	16,0	125	0,0210	T.D5	0153, 0253

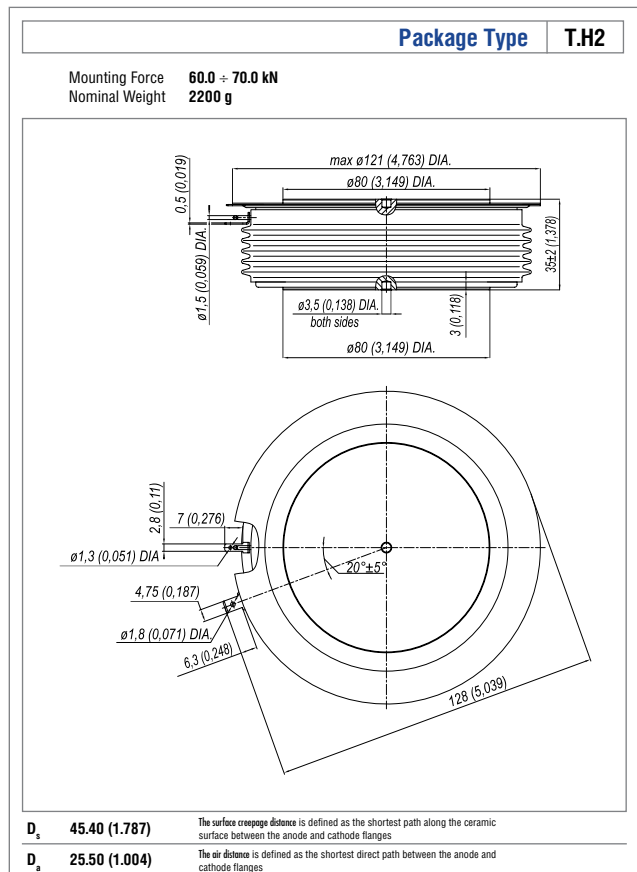
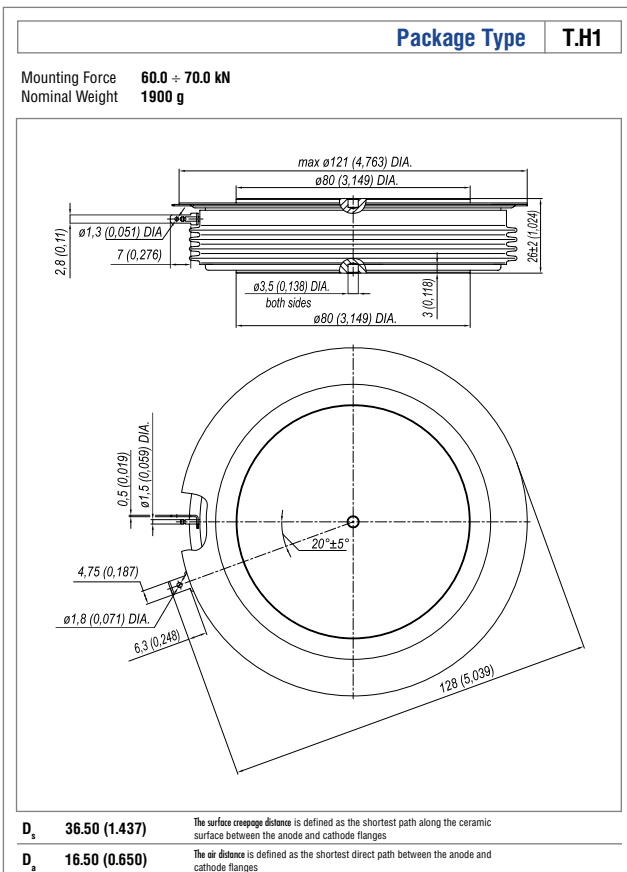
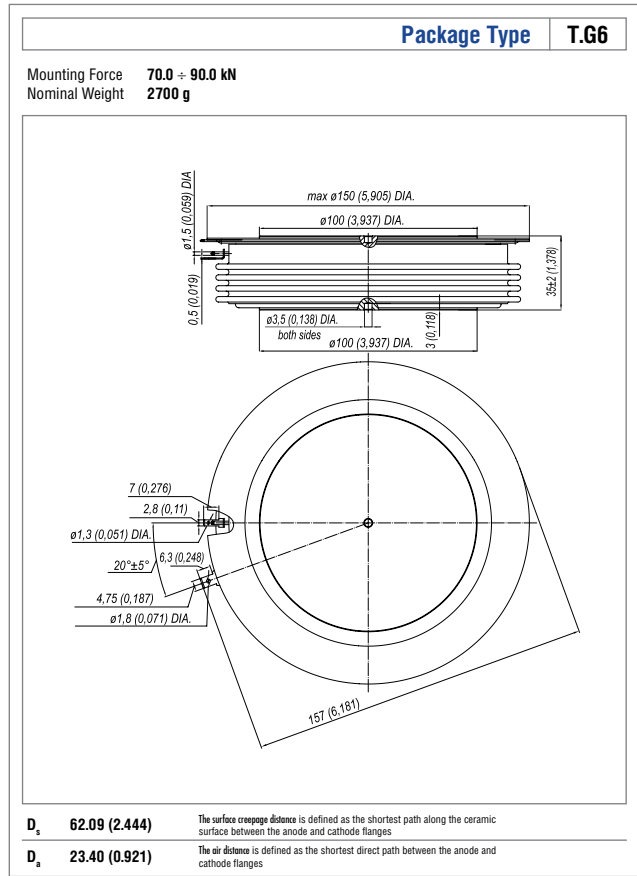
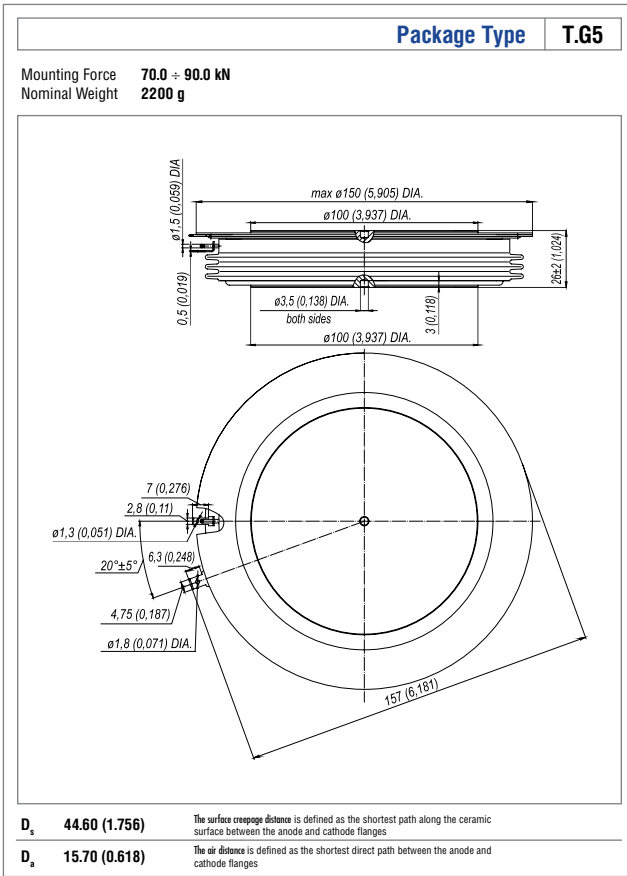
Part Number	∅ of the element	V_{DRM}^{RRM}	I_{TSM}	I_{TAV}	V_{TM}	I_{TM}	$V_{T(TO)}$	r_T	t_q	T_{jmax}	R_{thjc}	Package	Recommended Heatsinks
		[V]	[kA]	[T _c , C°]	[V]	[A]	[V]	[mΩ]	[μs]	[°C]	[°C/W]		
up to 2200 V													
TFI243-400	40	2000÷2200	8,0	400 (88)	2,85	1256	1,50	1,400	25,0	125	0,0340	T.C3	0143, 0243, 0343
TFI643-400	40	2000÷2200	8,0	400 (88)	2,85	1256	1,50	1,400	25,0	125	0,0340	T.C2	0143, 0243, 0343
TFI243-500	40	2000÷2200	9,0	500 (85)	2,40	1570	1,40	0,800	32,0	125	0,0340	T.C3	0143, 0243, 0343
TFI443-400	40	2000÷2200	8,5	400 (90)	2,85	1256	1,50	1,400	25,0	125	0,0300	T.C1	0143, 0243, 0343
TFI443-500	40	2000÷2200	9,5	500 (89)	2,40	1570	1,20	0,650	32,0	125	0,0300	T.C1	0143, 0243, 0343
TFI643-500	40	2000÷2200	9,0	500 (85)	2,40	1570	1,40	0,800	32,0	125	0,0340	T.C2	0143, 0243, 0343
TFI243-630	40	2000÷2200	10,0	630 (80)	2,30	1978	1,20	0,650	32,0	125	0,0340	T.C3	0143, 0243, 0343
TFI443-630	40	2000÷2200	10,5	630 (83)	2,40	1570	1,20	0,650	32,0	125	0,0300	T.C1	0143, 0243, 0343
TFI643-630	40	2000÷2200	10,0	630 (80)	2,30	1978	1,20	0,650	32,0	125	0,0340	T.C2	0143, 0243, 0343
TFI253-800	56	2000÷2200	17,0	800 (85)	2,50	2512	1,40	0,490	20,0	125	0,0210	T.D5	0153, 0253
TFI253-1000	56	2000÷2200	18,0	1000 (75)	2,35	3140	1,20	0,470	20,0	125	0,0210	T.D5	0153, 0253
TFI253-1250	56	2000÷2200	19,5	1250 (71)	2,10	3140	1,25	0,300	50,0	125	0,0200	T.D5	0153, 0253
TFI673-2000	80	1800÷2000	43,0	2000 (91)	2,20	6280	1,25	0,150	32,0	125	0,0085	T.F2	0173
TFI273-2000	80	1800÷2000	40,0	2000 (85)	2,20	6280	1,25	0,150	32,0	125	0,0100	T.F5	0173
up to 2800 V													
TFI233-320	32	2000÷2400	6,3	320 (85)	2,60	1005	1,50	1,250	25,0	125	0,0500	T.B3	0143, 0243, 0343
TFI333-320	32	2000÷2400	6,3	320 (85)	2,60	1005	1,50	1,250	25,0	125	0,0500	T.B2	0143, 0243, 0343
TFI233-400	32	2000÷2400	6,6	400 (80)	2,10	1256	1,40	0,870	50,0	125	0,0500	T.B3	0143, 0243, 0343
TFI353-1000	56	2000÷2800	19,0	1000 (81)	2,25	3140	1,35	0,350	50,0	125	0,0200	T.D5	0153, 0253
TFI373-1600	80	2000÷2800	34,5	1600 (90)	2,26	5024	1,40	0,200	50,0	125	0,0100	T.F5	0173
TFI773-1600	80	2000÷2800	37,0	1600 (95)	2,26	5024	1,40	0,200	50,0	125	0,0085	T.F2	0173
TFI373-2000	80	2000÷2500	37,2	2000 (84)	2,05	6280	1,30	0,150	40,0	125	0,0100	T.F5	0173
TFI773-2000	80	2000÷2500	40,0	2000 (90)	2,05	6280	1,30	0,150	40,0	125	0,0085	T.F2	0173
TFI393-2500	100	2000÷2800	72,0	2500 (89)	2,15	6300	1,40	0,130	50,0	125	0,0065	T.G6	0173
TFI393Ag-2500	100	2000÷2800	75,0	2500 (94)	2,15	6300	1,40	0,130	50,0	125	0,0055	T.G6	0173
up to 3600 V													
TFI933-250	34	3000÷3600	5,4	250 (97)	3,00	785	2,00	1,200	50,0	125	0,0400	T.B3	0143, 0243, 0343
TFI353-700	56	3000÷3000	14,0	700 (87)	2,85	2512	1,50	0,500	40,0	120	0,0200	T.D5	0153, 0253
TFI353-800	56	3000÷3400	16,0	800 (80)	2,60	2512	1,30	0,700	63,0	125	0,0210	T.D5	0153, 0253
up to 4400 V													
TFI473-1600	80	3800÷4000	30,0	1600 (85)	2,70	5024	1,44	0,270	125,0	125	0,0100	T.F5	0173
TFI873-1600	80	3800÷4000	32,0	1600 (91)	2,70	5024	1,44	0,270	125,0	125	0,0085	T.F2	0173











Overview Rectifier Diodes in Disc Housings

6500				D453-1250	
6000	D123-200			D353-800	
5000					D273-2500
4400		D233-500 • D333-500	D243-800 • D443-800		D173-2500
3600				D353-1600	D173-3200
2800	D123-320	D133-630 • D333-630			D173-4000
2600			D243-1000 • D443-1000		
2400				D253-1600	
2000		D333-800			D173-5000
1800	D123-500	D133-1000 • D233-1000	D143-1250 • D343-1250	D253-2000	D173-6300
Blocking voltage [V] ∅ of the element [mm]	24	32	40	56	80

Overview Fast Diodes in Disc Housings

4400			DF443-320	DF453-800	
3600					DF373-2000
2800		DF233-400		DF253-630	DF273-1600
2400		DF233-200	DF243-800	DF253-1000	DF273-2000
1800			DF243-630 • DF243-1000	DF153-630	DF173-2000
1600	DF223-320				
1200	DF123-320	DF133-500	DF243-500	DF153-1000	
Blocking voltage [V] ∅ of the element [mm]	24	32	40	56	80

Overview Avalanche Diodes in Disc Housings

6000				DA153-800	
3200				DA153-1600	DA273-3200
2800			DA243-500	DA153-1250 DA253-1600	DA173-3200 DA173-4000
1800	DA123-320	DA333-500		DA253-2000	DA173-5000
Blocking voltage [V] ∅ of the element [mm]	24	32	40	56	80

Overview Welding Diodes in Disc Housings

400				D053-7100	
Blocking voltage [V] ∅ of the element [mm]				51	

Part numbering guide

D	123	-	500	-	18	-	N
1	2		3		4		5

1. D — Rectifier diode / DF — Fast diode / DA — Avalanche diode / D — Welding diode
2. Design version
3. Mean forward current, A
4. Voltage code
5. Ambient conditions: N - normal; T - tropical

Rectifier Diodes

Part Number	∅ of the element	V _{RRM}	I _{FSM}	I _{FAV}	V _{FM}	I _{FM}	V _T ^{F(T0)} _{j max}	r _T	T _{j max}	R _{thjc}	Package	Recommended Heatsinks
		[V]	[kA]	[T _c , C°]	[V]	[A]	[V]	[mΩ]	[°C]	[°C/W]		
up to 1800 V												
D123-500	24	1000÷1800	7,5	500 (137)	1,55	1570	0,90	0,500	190	0,0700	D.A1	0123
D133-1000	32	1000÷1800	15,0	1000 (117)	1,55	3140	0,95	0,350	190	0,0400	D.B1	0143, 0243, 0343
D233-1000	32	1000÷1800	16,0	1000 (117)	1,55	3140	0,95	0,350	190	0,0400	D.B2	0143, 0243, 0343
D143-1250	40	1000÷1800	22,0	1250 (121)	1,65	3925	0,95	0,250	190	0,0320	D.C2	0143, 0243, 0343
D343-1250	40	1000÷1800	20,0	1250 (114)	1,65	3925	0,95	0,250	190	0,0350	D.C3	0143, 0243, 0343
D253-2000	56	1000÷1800	35,0	2000 (138)	1,55	6280	0,95	0,100	190	0,0180	D.D3	0153, 0253
D173-6300	80	1000÷1800	76,0	6300 (102)	1,30	12560	0,70	0,043	175	0,0085	D.F1	0173
up to 2800 V												
D123-320	24	2000÷2800	5,5	320 (135)	2,00	1005	1,00	1,000	175	0,0700	D.A1	0123
D133-630	32	2000÷2800	12,0	630 (133)	1,60	1978	1,10	0,350	175	0,0400	D.B2	0143, 0243, 0343
D333-630	32	2000÷2800	10,0	630 (128)	1,60	1978	1,10	0,350	175	0,0450	D.B3	0143, 0243, 0343
D333-800	32	1800÷2000	12,0	800 (134)	1,60	2512	1,00	0,270	190	0,0450	D.B3	0143, 0243, 0343
D243-1000	40	2000÷2600	19,0	1000 (122)	1,65	3140	0,95	0,280	175	0,0320	D.C2	0143, 0243, 0343
D443-1000	40	2000÷2600	18,0	1000 (117)	1,65	3140	0,95	0,280	175	0,0350	D.C3	0143, 0243, 0343
D253-1600	56	2000÷2400	35,0	1600 (147)	1,50	5024	1,00	0,120	190	0,0180	D.D3	0153, 0253
D173-4000	80	2000÷2800	55,0	4000 (124)	1,80	12560	0,85	0,065	175	0,0085	D.F1	0173
D173-5000	80	2000	60,0	5000 (109)	1,65	12560	0,75	0,650	175	0,0085	D.F1	0173
up to 3600 V												
D353-1600	56	3000÷3600	26,0	1600 (133)	2,00	5024	0,85	0,150	175	0,0180	D.D3	0153, 0253
D173-3200	80	3000÷3600	50,0	3200 (109)	1,80	10048	1,25	0,080	160	0,0085	D.F1	0173
up to 4400 V												
D233-500	32	3800÷4400	7,5	500 (106)	2,00	1570	1,05	0,900	150	0,0400	D.B2	0143, 0243, 0343
D333-500	32	3800÷4400	6,5	500 (101)	2,00	1570	1,05	0,900	150	0,0450	D.B3	0143, 0243, 0343
D243-800	40	3800÷4400	13,5	800 (99)	1,95	2512	1,00	0,500	150	0,0320	D.C2	0143, 0243, 0343
D443-800	40	3800÷4400	12,5	800 (94)	1,95	2512	1,00	0,500	150	0,0350	D.C3	0143, 0243, 0343
D173-2500	80	3800÷4400	40,0	2500 (116)	1,80	7850	0,80	0,125	150	0,0085	D.F1	0173
up to 6500 V												
D123-200	24	4600÷6000	3,0	200 (116)	2,50	628	1,10	2,600	150	0,0700	D.A1	0123
D353-800	56	4600÷6000	12,0	800 (100)	2,40	2512	1,31	0,740	140	0,0180	D.D3	0143, 0243, 0343
D453-1250	56	4600÷6500	18,0	1250 (101)	2,40	3925	0,95	0,400	150	0,0180	D.D3	0143, 0243, 0343
D273-2500	80	4600÷5000	40,0	2500 (112)	1,90	7850	0,85	0,150	150	0,0085	D.F1	0173

Welding Diodes

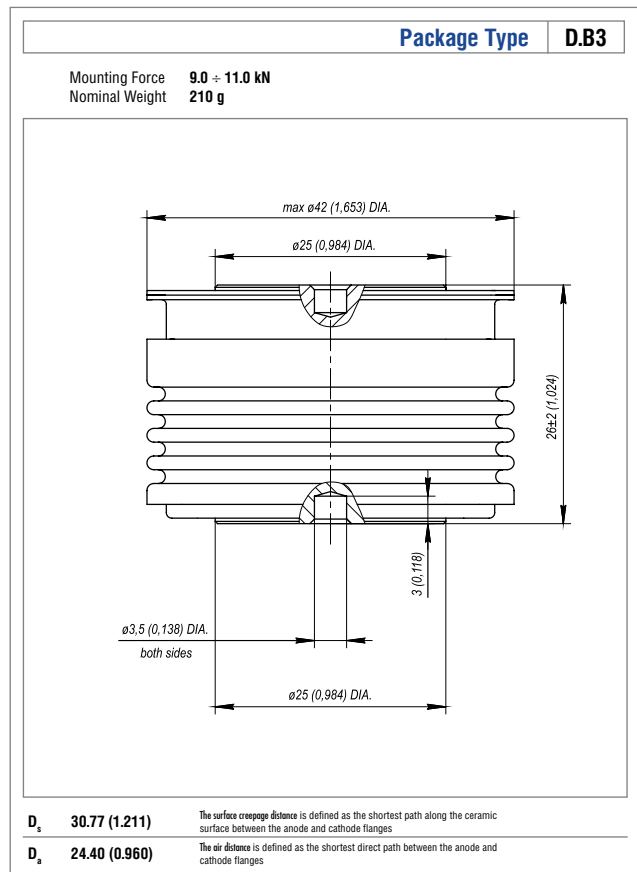
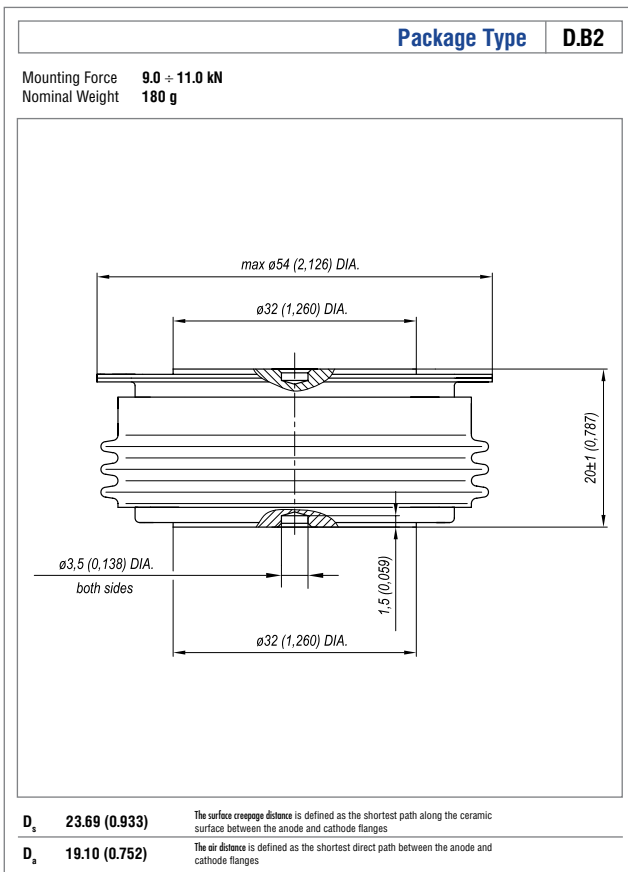
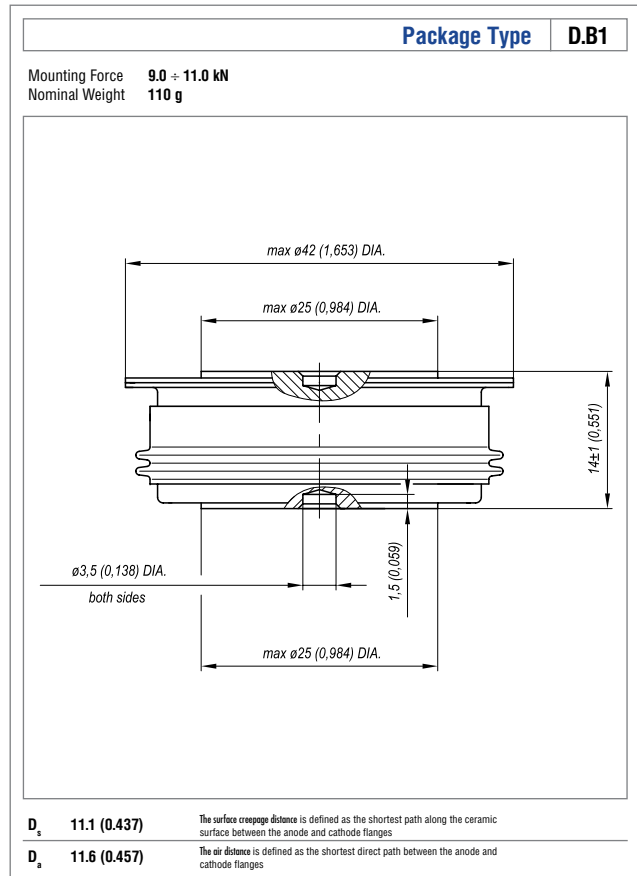
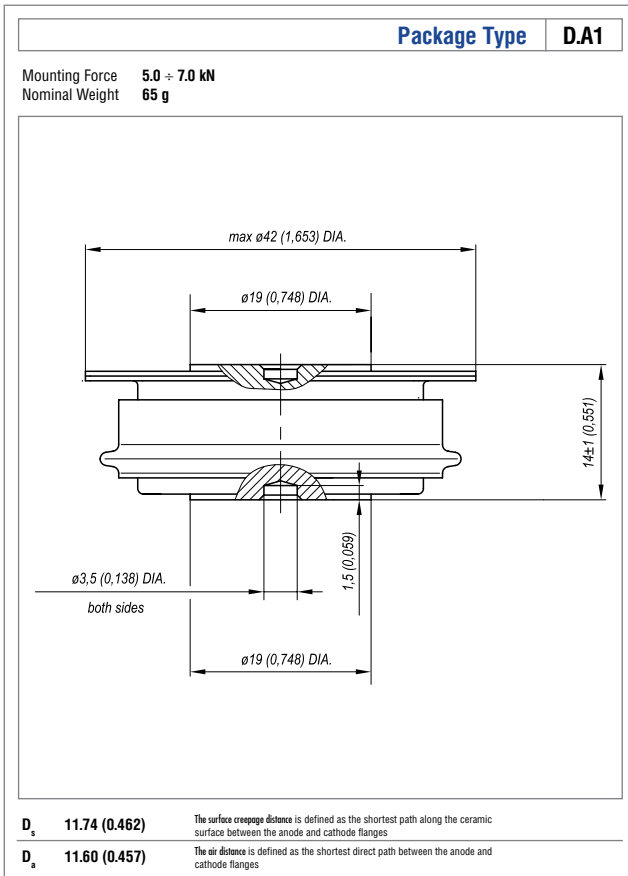
Part Number	∅ of the element	V _{RRM}	I _{FSM}	I _{FAV}	V _{FM}	I _{FM}	V _T ^{F(T0)} _{j max}	r _T	T _{j max}	R _{thjc}	Package	Recommended Heatsinks
		[V]	[kA]	[T _c , C°]	[V]	[A]	[V]	[mΩ]	[°C]	[°C/W]		
D053-7100	51	200÷400	55,0	7100 (84,5)	1,05	5000	0,70	0,029	170	0,0100	D.H1	–

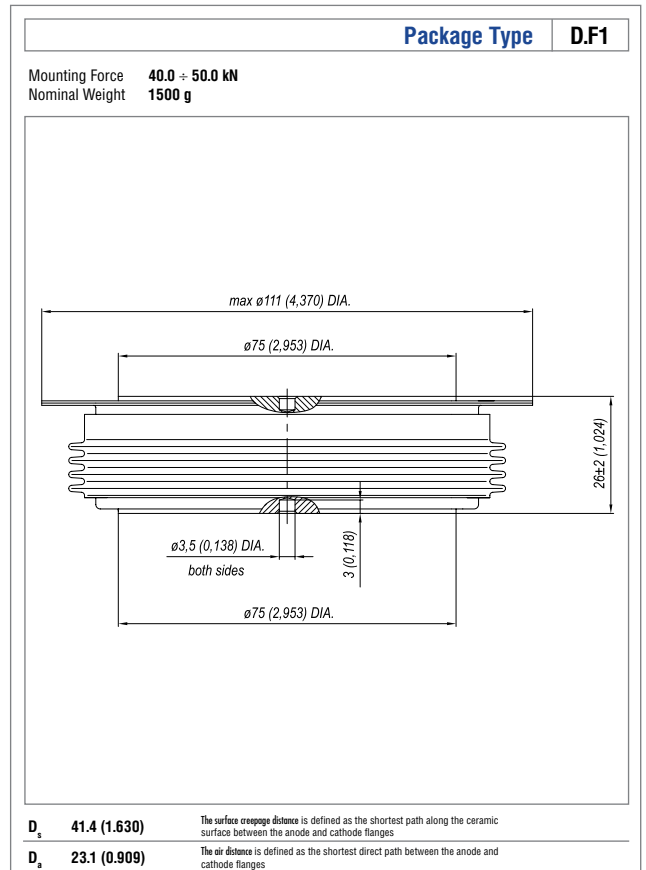
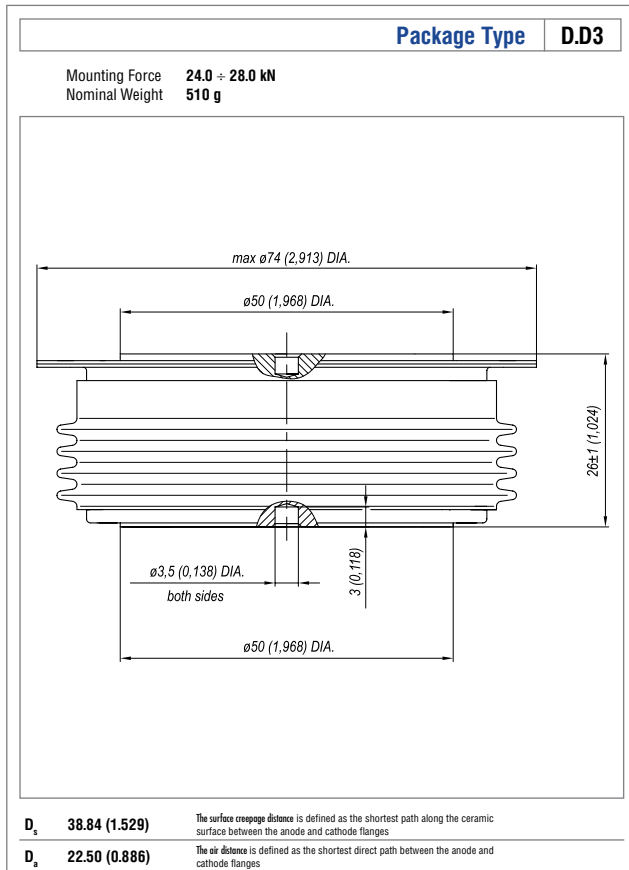
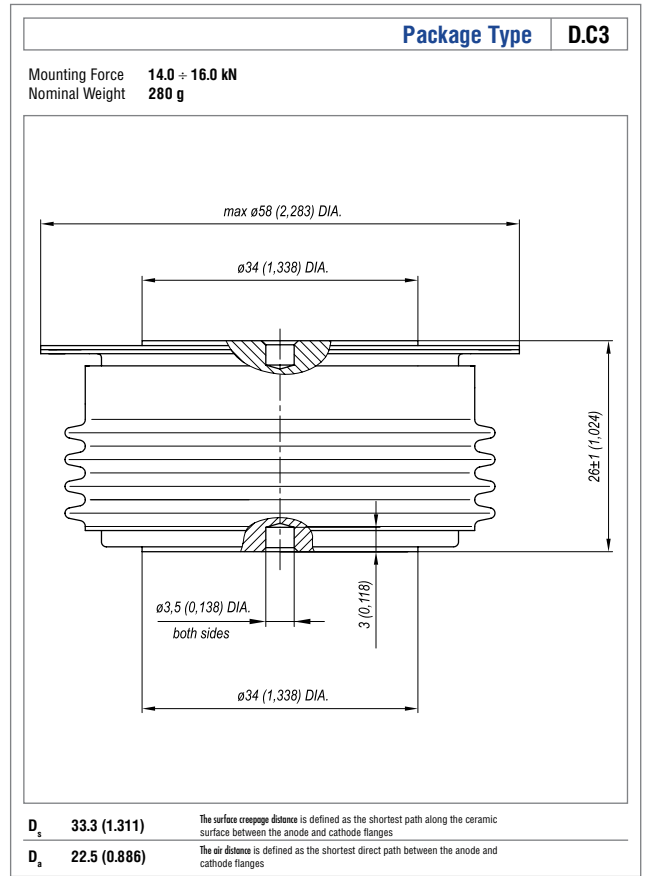
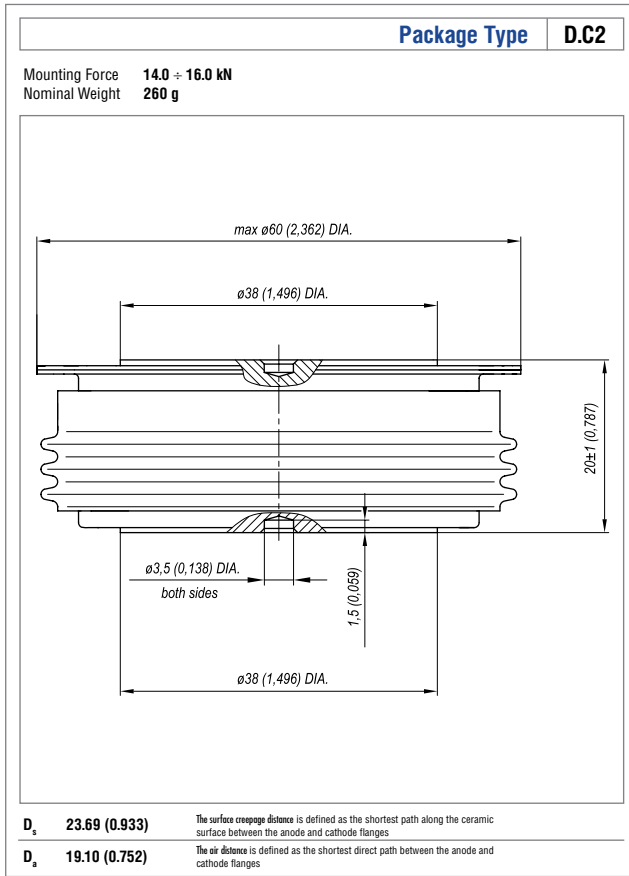
Fast Diodes

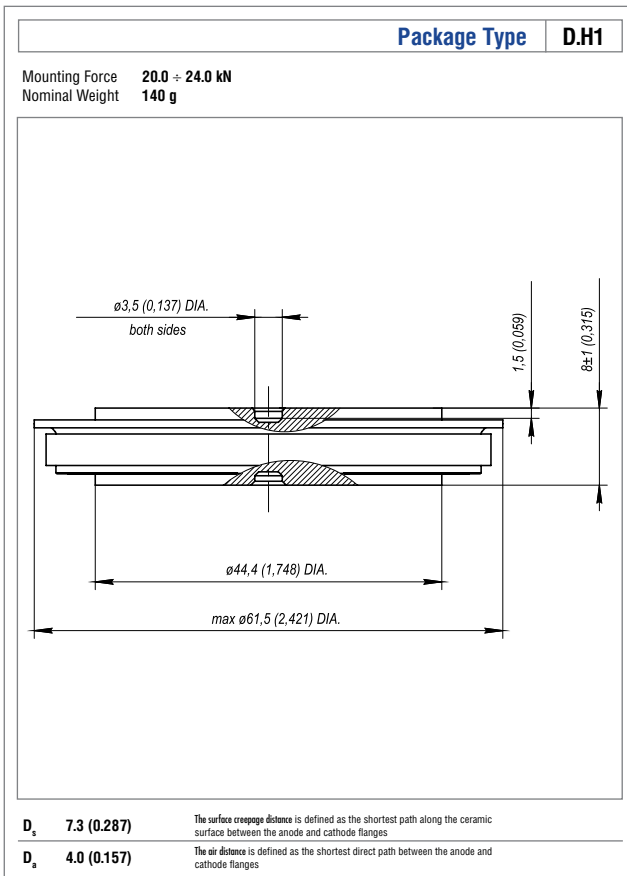
Part Number	∅ of the element	V _{RRM}	I _{FSM}	I _{FAV}	V _{FM}	I _{FM}	V _{Tjmax} ^{F(TO)}	r _T	t _{rr}	T _{jmax}	R _{thjc}	Package	Recommended Heatsinks
		[V]	[kA]	[T _c ,C°]	[V]	[A]	[V]	[mΩ]	[μs]	[°C]	[°C/W]		
up to 1800 V													
DF123-320	24	1000÷1200	6,0	320 (108)	1,70	1005	1,20	0,850	3,2	150	0,0700	D.A1	0123
DF223-320	24	1000÷1600	5,0	320 (102)	2,20	1005	1,25	1,100	2,5	150	0,0700	D.A1	0123
DF133-500	32	1000÷1200	8,5	500 (91)	2,20	1570	1,25	0,350	2,5	125	0,0400	D.B1	0143, 0243, 0343
DF243-500	40	1000÷1200	12,0	500 (97)	2,30	1570	1,25	0,400	2,0	125	0,0320	D.C2	0143, 0243, 0343
DF243-630	40	1000÷1800	14,0	630 (91)	2,30	1978	1,20	0,300	3,2	125	0,0320	D.C2	0143, 0243, 0343
DF243-1000	40	1000÷1800	15,0	1000 (68)	1,80	3140	1,15	0,250	5,0	125	0,0320	D.C2	0143, 0243, 0343
DF153-630	56	1000÷1800	25,0	630 (105)	3,00	1978	1,25	0,300	2,5	125	0,0180	D.D3	0153, 0253
DF153-1000	56	1000÷1200	29,0	1000 (95)	1,90	3140	1,15	0,200	2,5	125	0,0180	D.D3	0153, 0253
DF173-2000	80	1000÷1800	50,0	2000 (93)	1,80	6280	1,20	0,130	6,3	125	0,0085	D.F1	0173
up to 2800 V													
DF233-200	32	2000÷2400	6,0	200 (107)	2,20	628	1,35	1,700	1,25	125	0,0400	D.B2	0143, 0243, 0343
DF233-400	32	2000÷2800	7,0	400 (94)	1,90	1256	1,20	0,700	5,0	125	0,0400	D.B2	0143, 0243, 0343
DF243-800	40	2000÷2400	12,5	800 (74)	2,20	2512	1,30	0,350	4,0	125	0,0320	D.C2	0143, 0243, 0343
DF253-630	56	2000÷2800	20,0	630 (103)	3,00	1978	1,35	0,350	3,2	125	0,0180	D.D3	0153, 0253
DF253-1000	56	2000÷2400	22,0	1000 (89)	2,20	3140	1,35	0,250	4,0	125	0,0180	D.D3	0153, 0253
DF273-1600	80	2000÷2800	44,0	1600 (98)	2,10	5024	1,30	0,170	8,0	125	0,0085	D.F1	0173
DF273-2000	80	2000÷2400	46,0	2000 (90)	1,85	6280	1,30	0,150	8,0	125	0,0085	D.F1	0173
up to 3600 V													
DF373-2000	80	3000÷3600	40,0	2000 (84)	2,10	6280	1,40	0,200	16,0	125	0,0085	D.F1	0173
up to 4400 V													
DF443-320	40	3800÷4400	6,0	320 (90)	3,60	1000	1,50	2,000	4,0	125	0,0350	D.C3	0143, 0243, 0343
DF453-800	56	3800÷4400	13,5	800 (85)	2,90	2512	1,40	0,700	5,3	125	0,0180	D.D3	0153, 0253

Avalanche Diodes

Part Number	∅ of the element	V _{RRM}	I _{FSM}	I _{FAV}	V _{FM}	I _{FM}	V _{Tjmax} ^{F(TO)}	r _T	T _{jmax}	R _{thjc}	Package	Recommended Heatsinks
		[V]	[kA]	[T _c ,C°]	[V]	[A]	[V]	[mΩ]	[°C]	[°C/W]		
up to 1800 V												
DA123-320	24	1000÷1800	5,5	320 (110)	1,60	1005	0,95	1,050	150	0,0700	D.A1	0123
DA333-500	32	1000÷1800	12,0	500 (120)	1,60	1570	0,95	0,440	150	0,0400	D.B2	0143, 0243, 0343
DA253-2000	56	1000÷1800	30,0	2000 (101)	2,00	6280	0,95	0,220	175	0,0180	D.D3	0153, 0253
DA173-5000	80	1000÷1800	60,0	5000 (84)	2,00	12560	0,60	0,125	175	0,0085	D.F1	0173
up to 2800 V												
DA243-500	40	2000÷2800	13,0	500 (118)	2,00	1570	1,00	0,800	150	0,0320	D.C2	0143, 0243, 0343
DA153-1250	56	2000÷2800	22,0	1250 (121)	2,20	3925	1,00	0,450	175	0,0180	D.D3	0153, 0253
DA253-1600	56	2000÷2800	25,0	1600 (112)	2,10	5024	1,00	0,300	175	0,0180	D.D3	0153, 0253
DA173-3200	80	2000÷2800	47,0	3200 (115)	2,00	10048	1,00	0,150	175	0,0085	D.F1	0173
DA173-4000	80	2000÷2800	50,0	4000 (107)	2,20	12560	1,00	0,100	175	0,0085	D.F1	0173
up to 3600 V												
DA153-1600	56	2400÷3200	27,0	1600 (111)	2,00	5024	0,95	0,320	175	0,0180	D.D3	0153, 0253
DA273-3200	80	3000÷3600	42,0	3200 (103)	2,20	10048	1,05	0,200	175	0,0085	D.F1	0173
up to 6000 V												
DA153-800	56	4600÷6000	14,0	800 (108)	2,20	2512	0,90	0,650	140	0,0180	D.D3	0153, 0253







PART II

Devices in Stud Design

Main Characteristics:

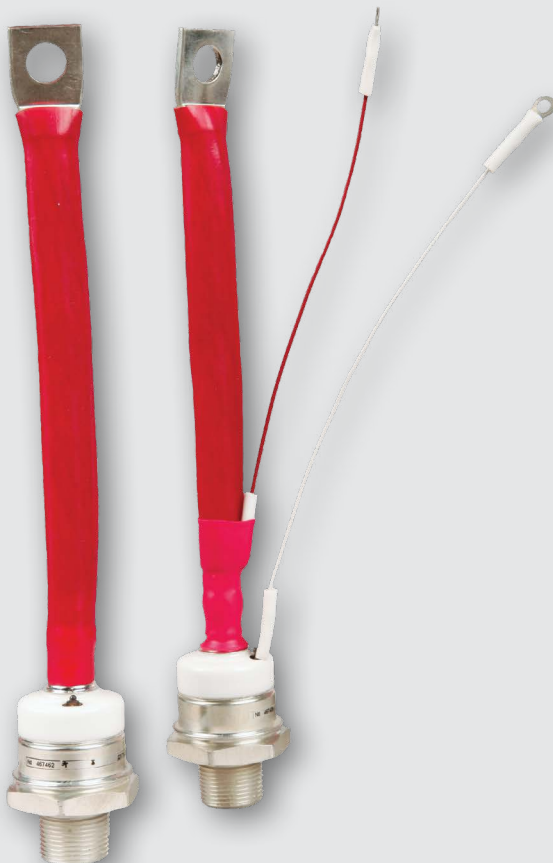
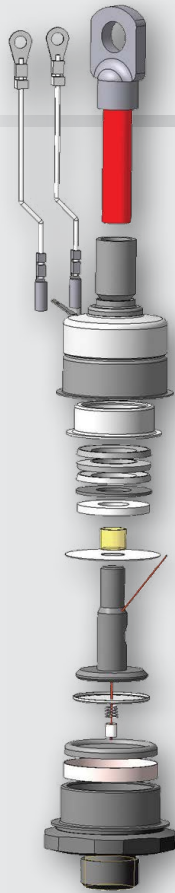
- Mean on-state and forward currents up to 500 A.
- Blocking voltage up to 1800 V.
- Pressure contact construction.
- Simple mounting.
- High resistance to cyclic load.
- Diodes can be supplied with direct and reverse polarity.
- Metric and inch thread.

Optional opportunities:

- Selection of devices in groups for parallel, series and combined connection.
- Delivery of devices assembled with heat sinks.

Application:

Devices in stud design are applied in railway transport: rectifier bridges, AC control, electric motor drive for industry and transport.



Overview Phase Control Thyristors in Stud Housings

1600	T161-125 • 161-160 • 161-200	T171-200 • T171-250 • T171-320 T175-200 • T275-250 • T275-320 T371-200 • T471-250 • T471-320
800		T175-250 • T175-320 • T271-250 T271-320 • T371-250 • T371-320
Blocking voltage [V]	24	32
∅ of the element [mm]		

Overview Fast Thyristors in Stud Housings

1400	TFI261-125 • TFI261-160	TFI271-160 • TFI271-200 • TFI271-250 TFI271-320 • TFI175-200 • TFI175-250 TFI371-200 • TFI371-250
Blocking voltage [V]	24	32
∅ of the element [mm]		

Overview Rectifier Diodes in Stud Housings

1800	D161-200 • D161-250 D161-320 • D161-400	D171-400 • D175-400 D271-400
1200		D171-500 • D175-500 D271-500
Blocking voltage [V]	24	32
∅ of the element [mm]		

Overview Fast Diodes in Stud Housings

1600	DF261-250	
1400	DF261-320	DF271-400
Blocking voltage [V]	24	32
∅ of the element [mm]		

Overview Avalanche Diodes in Stud Housings

1800	DA161-200	DA171-320
Blocking voltage [V]	24	32
∅ of the element [mm]		

Part numbering guide

TFI	261	-	125	-	14	-	A2	T3	-	N
1	2		3		4		5	6		7

1. T — Phase control thyristor / TFI — Fast thyristor
2. Design version
3. Mean on-state current, A
4. Voltage code
5. Critical rate of rise of off-state voltage
6. Group of turn-off time
7. Ambient conditions: N - normal; T - tropical

DF	261	-	250		-	16	-	M4	-	N
1	2		3	4		5		6		7

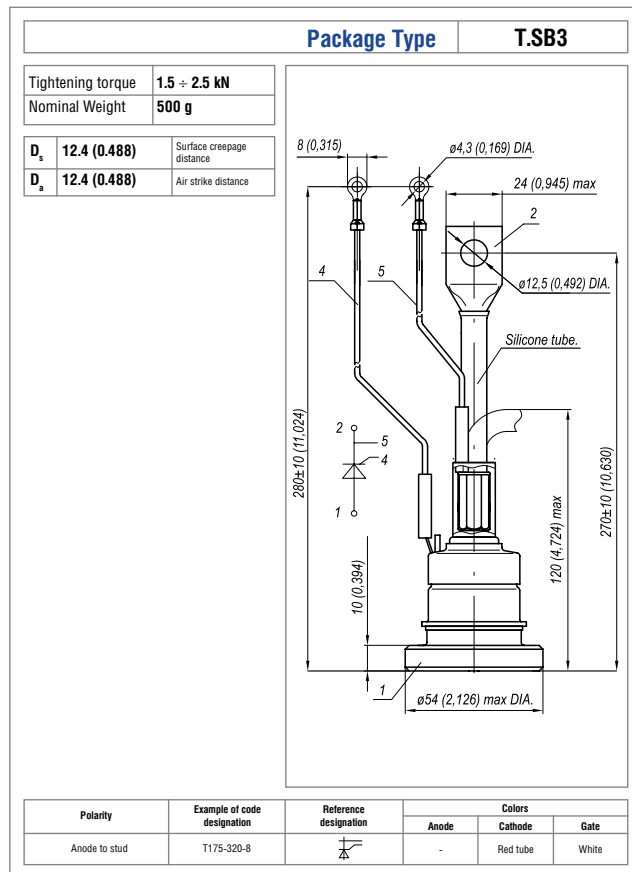
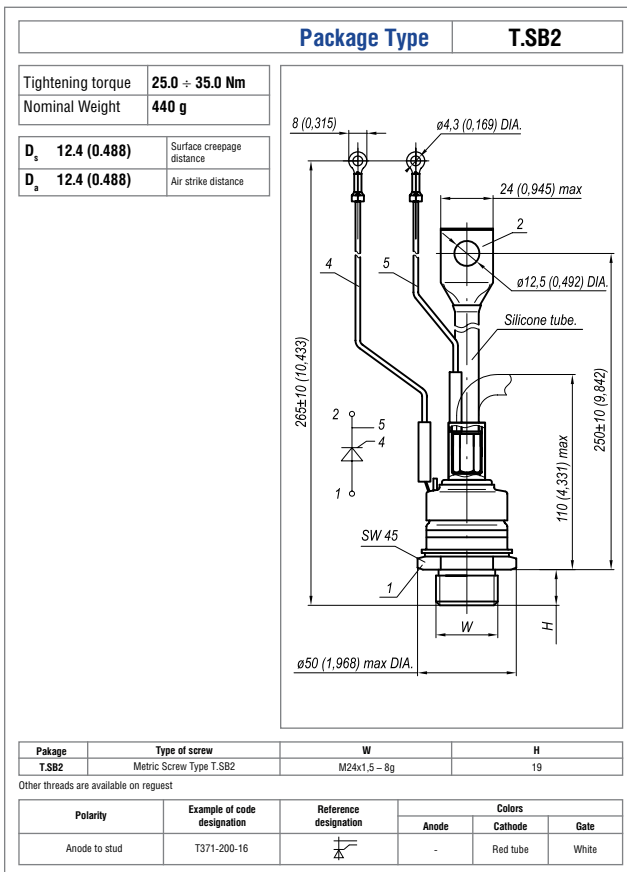
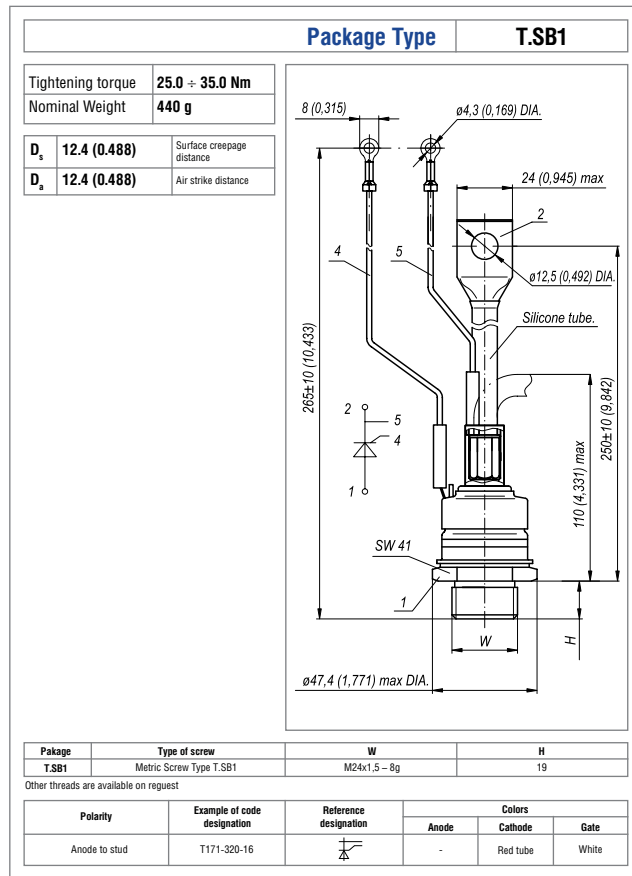
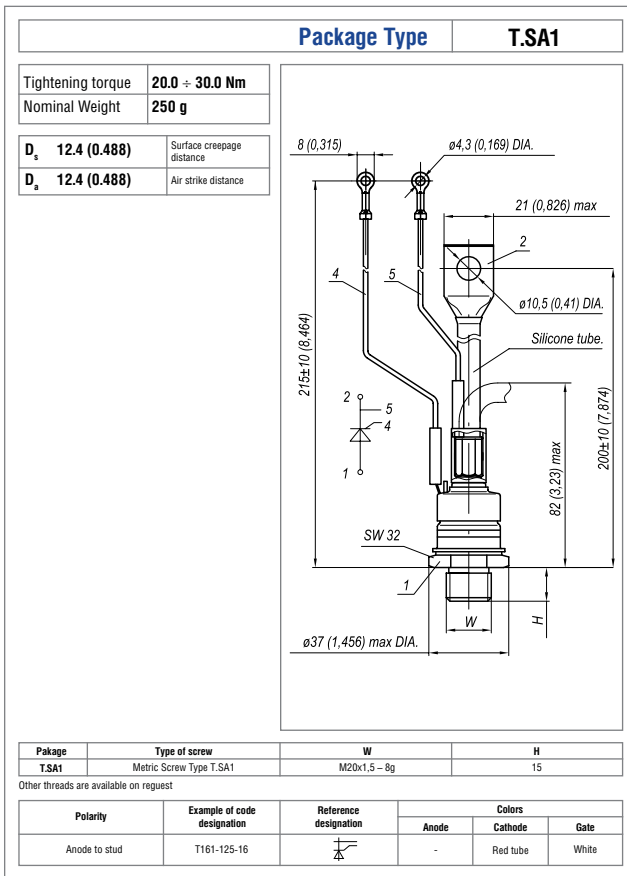
1. D — Rectifier diode / DF — Fast diode / DA — Avalanche diode
2. Design version
3. Mean forward current, A
4. Polarity: X - Cathode to Stud; Anode to Stud - no symbol
5. Voltage code

Phase Control Thyristors

Part Number	Ø of the element	V_{DRM} V_{RRM}	I_{TSM}	I_{TAV}	V_{TM}	I_{TM}	$V_{T(TO)}$ $V_{T(jmax)}$	r_T	t_q	T_{jmax}	R_{thjc}	Package	Recommended Heatsinks
		[V]	[kA]	[T _c ,C°]	[V]	[A]	[V]	[mΩ]	[μs]	[°C]	[°C/W]		
up to 800 V													
T175-250	32	100÷800	12,0	250 (125)	1,50	785	0,95	0,760	125	150	0,0700	T.SB3	-
T271-250	32	100÷800	10,0	250 (121)	1,50	785	0,95	0,760	125	150	0,0800	T.SB1	0181, 0281
T371-250	32	100÷800	10,0	250 (121)	1,50	785	0,95	0,760	125	150	0,0800	T.SB2	0181, 0281
T175-320	32	100÷800	13,0	320 (126)	1,25	1005	0,80	0,340	125	150	0,0700	T.SB3	-
T271-320	32	100÷800	11,5	320 (122)	1,25	1005	0,80	0,340	125	150	0,0800	T.SB1	0181, 0281
T371-320	32	100÷800	11,5	320 (122)	1,25	1005	0,80	0,340	125	150	0,0800	T.SB2	0181, 0281
up to 1800 V													
T161-125	24	100÷1600	2,5	125 (103)	1,75	393	1,15	1,800	125	125	0,1000	T.SA1	0171, 0271, 0371
T161-160	24	100÷1600	4,0	160 (99)	1,70	502	1,05	1,360	125	125	0,1000	T.SA1	0171, 0271, 0371
T161-200	24	100÷1600	5,0	200 (98)	1,60	628	0,90	0,850	125	125	0,1000	T.SA1	0171, 0271, 0371
T171-200	32	100÷1600	7,5	200 (100)	1,75	628	1,00	1,120	125	125	0,0800	T.SB1	0181, 0281
T175-200	32	100÷1600	9,0	200 (103)	1,75	628	1,00	1,120	125	125	0,0700	T.SB3	-
T371-200	32	100÷1600	7,5	200 (100)	1,75	628	1,00	1,120	125	125	0,0800	T.SB2	0181, 0281
T171-250	32	100÷1600	9,0	250 (93)	1,75	785	1,00	0,950	125	125	0,0800	T.SB1	0181, 0281
T471-250	32	100÷1600	9,0	250 (93)	1,75	785	1,00	0,950	125	125	0,0800	T.SB2	0181, 0281
T171-320	32	100÷1600	10,0	320 (90)	1,60	1005	0,95	0,510	125	125	0,0800	T.SB1	0181, 0281
T275-250	32	100÷1600	10,5	250 (97)	1,75	785	1,00	0,950	125	125	0,0700	T.SB3	-
T275-320	32	100÷1600	12,0	320 (94)	1,60	1005	0,95	0,510	125	125	0,0700	T.SB3	-
T471-320	32	100÷1600	10,0	320 (90)	1,60	1005	0,95	0,510	125	125	0,0800	T.SB2	0181, 0281

Fast Thyristors

Part Number	Ø of the element	V_{DRM} V_{RRM}	I_{TSM}	I_{TAV}	V_{TM}	I_{TM}	$V_{T(TO)}$ $V_{T(jmax)}$	r_T	t_q	T_{jmax}	R_{thjc}	Package	Recommended Heatsinks
		[V]	[kA]	[T _c ,C°]	[V]	[A]	[V]	[mΩ]	[μs]	[°C]	[°C/W]		
up to 1800 V													
TFI261-125	24	1000÷1400	3,5	125 (97)	2,30	393	1,45	2,500	16,0	125	0,1000	T.SA1	0171, 0271, 0371
TFI261-160	24	1000÷1400	4,0	160 (94)	1,85	502	1,20	1,800	20,0	125	0,1000	T.SA1	0171, 0271, 0371
TFI271-160	32	1000÷1400	5,0	160 (95)	2,20	502	1,65	1,700	16,0	125	0,0800	T.SB1	0181, 0281
TFI175-200	32	1000÷1400	6,5	200 (99)	1,96	628	1,31	1,100	20,0	125	0,0700	T.SB3	-
TFI271-200	32	1000÷1400	6,0	200 (95)	1,96	628	1,31	1,100	20,0	125	0,0800	T.SB1	0181, 0281
TFI371-200	32	1000÷1400	6,0	200 (95)	1,96	628	1,31	1,100	20,0	125	0,0800	T.SB2	0181, 0281
TFI175-250	32	1000÷1400	7,5	250 (97)	1,70	785	1,05	0,850	25,0	125	0,0700	T.SB3	-
TFI271-250	32	1000÷1400	7,0	250 (93)	1,70	785	1,05	0,850	25,0	125	0,0800	T.SB1	0181, 0281
TFI371-250	32	1000÷1400	7,0	250 (93)	1,70	785	1,05	0,850	25,0	125	0,0800	T.SB2	0181, 0281
TFI271-320	32	1000÷1400	9,0	320 (86)	1,80	1005	1,00	0,650	32,0	125	0,0800	T.SB1	0181, 0281



Rectifier Diodes

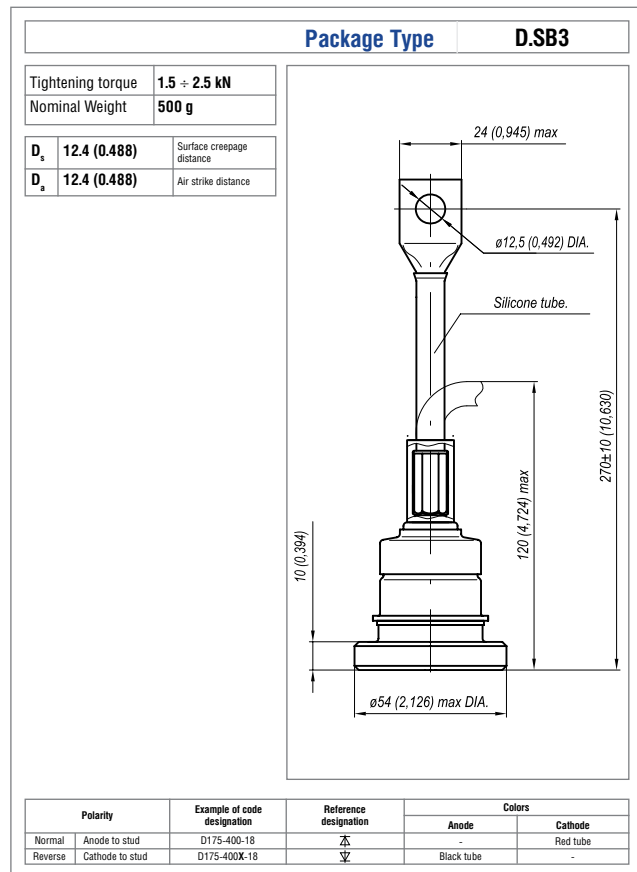
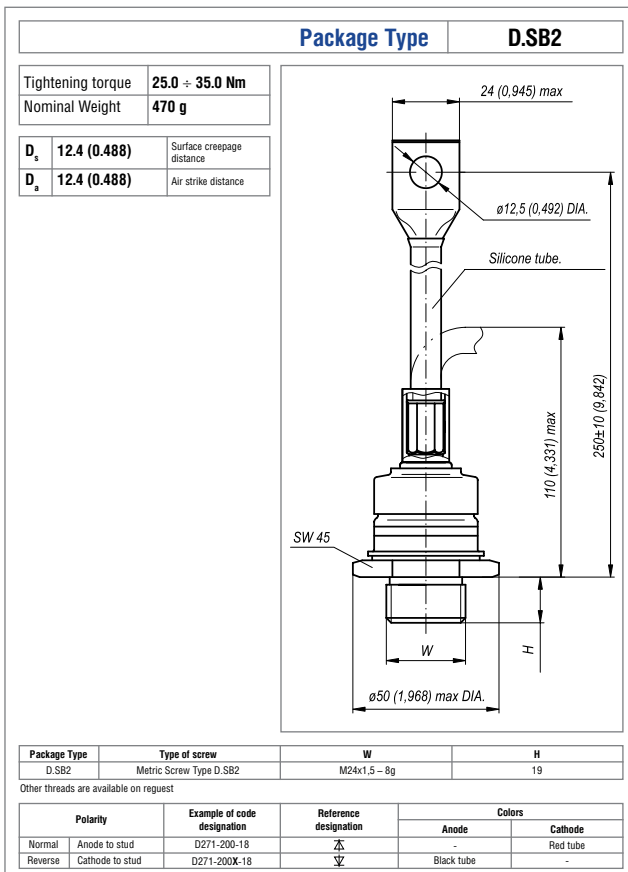
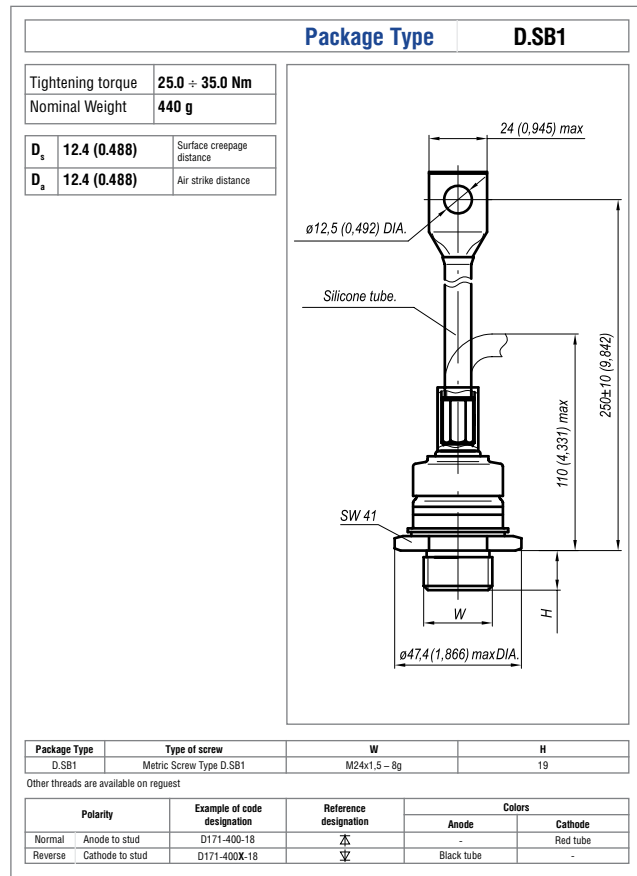
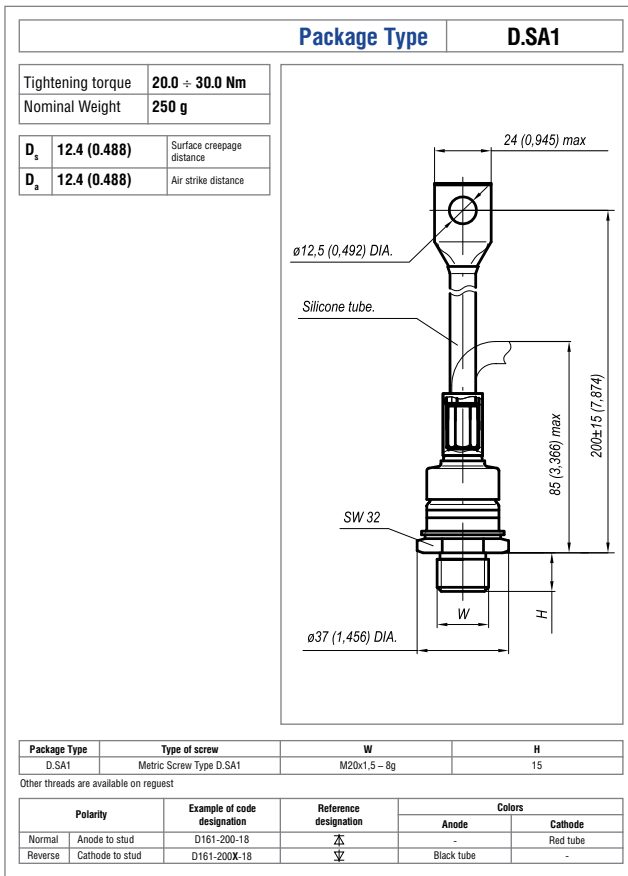
Part Number	∅ of the pellet	V_{RRM}	I_{FSM}	I_{FAV}	V_{FM}	I_{FM}	$\frac{V_F(TO)}{T_{jmax}}$	r_T	T_{jmax}	R_{thjc}	package	Recommended Heatsinks
		[V]	[kA]	[T_c, C°]	[V]	[A]	[V]	[mΩ]	[°C]	[°C/W]		
up to 1800 V												
D161-200	24	1000÷1800	5,5	200 (163)	1,35	628	0,90	0,850	190	0,1000	D.SA1	0171, 0271, 0371
D161-250	24	1000÷1800	6,4	250 (155)	1,35	785	0,90	0,770	190	0,1000	D.SA1	0171, 0271, 0371
D161-320	24	1000÷1800	7,5	320 (144)	1,35	1005	0,90	0,650	190	0,1000	D.SA1	0171, 0271, 0371
D161-400	24	1000÷1800	8,3	400 (134)	1,70	1256	0,90	0,500	190	0,1000	D.SA1	0171, 0271, 0371
D171-400	32	1000÷1800	14,0	400 (143)	1,45	1256	0,90	0,560	190	0,0800	D.SB1	0181, 0281
D175-400	32	1000÷1800	15,0	400 (149)	1,60	1256	0,90	0,560	190	0,0700	D.SB3	–
D271-400	32	1000÷1800	14,0	400 (143)	1,45	1256	0,90	0,560	190	0,0800	D.SB2	0181, 0281
D171-500	32	1000÷1200	15,0	500 (133)	1,40	1570	0,80	0,500	190	0,0800	D.SB1	0181, 0281
D175-500	32	1000÷1200	16,0	500 (140)	1,40	1570	0,80	0,500	190	0,0700	D.SB3	–
D271-500	32	1000÷1200	15,0	500 (133)	1,40	1570	0,80	0,500	190	0,0800	D.SB2	0181, 0281

Fast Diodes

Part Number	∅ of the element	V_{RRM}	I_{FSM}	I_{FAV}	V_{FM}	I_{FM}	$\frac{V_F(TO)}{T_{jmax}}$	r_T	t_{rr}	T_{jmax}	R_{thjc}	package	Recommended Heatsinks
		[V]	[kA]	[T_c, C°]	[V]	[A]	[V]	[mΩ]	[μs]	[°C]	[°C/W]		
up to 1800 V													
DF261-250	24	1000÷1600	4,5	250 (101)	2,20	785	1,25	1,100	2,5	150	0,1000	D.SA1	0171, 0271, 0371
DF261-320	24	1000÷1400	5,3	320 (90)	1,70	1005	1,20	0,850	3,2	150	0,1000	D.SA1	0171, 0271, 0371
DF271-400	32	1000÷1400	8,0	400 (85)	2,30	1256	1,20	0,800	3,2	150	0,0800	D.SB1	0181, 0281

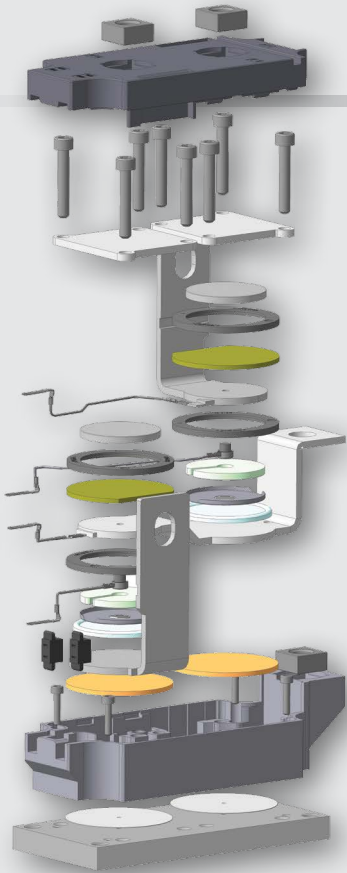
Avalanche Diodes

Part Number	∅ of the element	V_{RRM}	I_{FSM}	I_{FAV}	V_{FM}	I_{FM}	$\frac{V_F(TO)}{T_{jmax}}$	r_T	T_{jmax}	R_{thjc}	package	Recommended Heatsinks
		[V]	[kA]	[T_c, C°]	[V]	[A]	[V]	[mΩ]	[°C]	[°C/W]		
up to 1800 V												
DA161-200	24	1000÷1800	7,5	200 (123)	1,40	628	0,80	1,050	150	0,1000	D.SA1	0171, 0271, 0371
DA171-320	32	1000÷1800	11,0	320 (120)	1,40	1005	0,80	0,440	150	0,0800	D.SB1	0181, 0281



PART III

Devices in Module Design



Main Characteristics:

- Mean on-state and forward currents up to 1250 A.
- Blocking voltage up to 6500 V.
- Dimension of module copper baseplates
34*94 (housing F), 50*115 (housing C1), 70*104
(housing E1), 60*124 (housing A2), 77*150 (housing D).
- Single-sided cooling through copper base plate.
- Simple of mounting.
- High resistance to cyclic load due to pressure contact construction.
- Electrical isolated baseplate.
- Isolation voltage 3,0 kV AC per 1 minute or
3,6 kV DC per 1 second.
- Single and double components module.
- Modules of A2, F, D, E1 types are certified by UL
standard (Underwriters Laboratories).

Optional opportunities:

- Diode/thyristor combination in one housing.
- Module with fast thyristor and diode elements
are available.
- Production of modules with high isolation.
- Stacks with heat sink.

Application:

Devices in module design are applied in railway transport: rectifier bridges, AC control, electric motor drive for industry and transport.



Overview Thyristor Modules for Phase Control

6500			MTx-240-65-A2			
4400			MTx-260-44-A2	MTx-400-44-D		
3600	MTx-115-36-F	MTx-160-36-C1	MTx-320-36-A2	MT1-560-36-E	MTx-500-36-D	
2800	MTx-130-28-F	MTx-200-28-C1	MTx-400-28-A2	MT1-635-28-E	MTx-630-28-D	
2400			MTx-250-24-C1	MTx-430-24-A2		
2200	MTx-165-22-F			MT1-765-22-E	MTx-740-22-D	
1800	MTx-201-18-F	MTx-320-18-C1	MTx-540-18-A2 MT3-595-18-A2	MT1-830-18-E	MTx-800-18-D	
1200			MTx-650-12-A2	MTx-1000-12-D		
800					MTx-1250-8-D	
Blocking voltage[V] baseplate width [mm]	34	50	60	70	77	

Overview Diode Modules for Rectifier

6500			MDx-320-65-A2		
5200			MDx-380-52-A2		
4400			MDx-470-44-A2	MD1-950-44-E	MDx-800-44-D
3600	MDx-155-36-F	MDx-250-36-C1	MDx-515-36-A2		
3400					
2800	MDx-175-28-F	MDx-320-28-C1			MD1-1125-28-E MDx-1000-28-D
2600			MDx-580-26-A2		
2200	MDx-215-22-F			MD1-1280-22-E	
1800	MDx-245-18-F	MDx-400-18-C1	MDx-660-18-A2		
Blocking voltage[V] baseplate width [mm]	34	50	60	70	77

Part numbering guide

MT	3	-	540	-	18	-	A	-	N
1	2		3		4		5		6

1. Types of module: MT: Thyristor module; MT/D: Thyristor-Diode module; MD/T: Diode-Thyristor module
2. Circuit schematic (x):
3-serial connection; 4 - common Cathode; 5-common Anode
3. Average on-state current, A
4. Voltage code
5. Package type
6. Ambient conditions: N - Normal

MD	3	-	660	-	18	-	A	-	N
1	2		3		4		5		6

1. MD- Diode module
2. Circuit schematic (x):
3 - serial connection; 4 - common Cathode; 5 - common Anode
3. Mean forward current, A
4. Voltage code
5. Package type
6. Ambient conditions: N - Normal



Single Component Thyristor Modules (MT1)

Part Number	V_{DRM} V_{RRM}	I_{TSM}	I_{TAV}	V_{TM}	I_{TM}	$V_{T(TO)}$ T_{jmax}	r_T	t_q	T_{jmax}	R_{thjc}	Package	Baseplate width/length
	[V]	[kA]	[T_c, C°]	[V]	[A]	[V]	[m Ω]	[μ s]	[$^\circ$ C]	[$^\circ$ C/W]		[mm]
up to 1800 V												
MT1-830-18-E	1000÷1800	33,0	830 (85)	1,45	2500	0,80	0,240	250	130	0,0420	M.E1	70/104
up to 2400 V												
MT1-765-24-E	2000÷2400	32,0	765 (81)	1,50	2500	0,85	0,277	320	125	0,0420	M.E1	70/104
up to 2800 V												
MT1-635-28-E	2600÷2800	23,0	635 (85)	1,55	2500	0,95	0,350	320	125	0,0420	M.E1	70/104
up to 3600 V												
MT1-560-36-E	3000÷3600	21,0	560 (85)	2,10	2500	1,05	0,470	400	125	0,0420	M.E1	70/104

Dual Component Thyristor Modules (MT, MT/D, MD/T)

Part Number	V_{DRM} V_{RRM}	I_{TSM}	I_{TAV}	V_{TM}	I_{TM}	$V_{T(TO)}$ T_{jmax}	r_T	t_q	T_{jmax}	R_{thjc}	Package	Baseplate width/length
	[V]	[kA]	[T_c, C°]	[V]	[A]	[V]	[m Ω]	[μ s]	[$^\circ$ C]	[$^\circ$ C/W]		[mm]
up to 800 V												
MTx-1250-8-D MT/Dx-1250-8-D MD/Tx-1250-8-D	100÷800	34,0	1250 (77)	1,20	3925	0,80	0,120	160	150	0,0500	M.D	77/150
up to 1200 V												
MTx-650-12-A2 MT/Dx-650-12-A2 MD/Tx-650-12-A2	1000÷1200	14,0	650 (85)	1,40	1978	0,85	0,280	160	140	0,0650	M.A2	60/124
MTx-1000-12-D MT/Dx-1000-12-D MD/Tx-1000-12-D	1000÷1200	32,0	1000 (77)	1,25	3140	0,90	0,150	200	140	0,0500	M.D	77/150
up to 1800 V												
MTx-201-18-F MT/Dx-201-18-F MD/Tx-201-18-F	1000÷1800	6,0	201 (85)	1,40	500	0,80	0,970	125	130	0,1800	M.F1	34/94
MTx-320-18-C1 MT/Dx-320-18-C1 MD/Tx-320-18-C1	1000÷1800	8,5	320 (86)	1,40	785	0,75	0,500	160	130	0,0600	M.C1	50/115
MTx-540-18-A2 MT/Dx-540-18-A2 MD/Tx-540-18-A2	1400÷1800	15,5	540 (85)	1,50	1570	0,85	0,320	250	130	0,0650	M.A2	60/124
MT3-595-18-A2 MT/D3-595-18-A2 MD/T3-595-18-A2	1400÷1800	17,5	595 (85)	1,50	1570	0,84	0,310	320	135	0,0650	M.A2	60/124
MTx-800-18-D MT/Dx-800-18-D MD/Tx-800-18-D	1400÷1800	28,0	800 (78)	1,45	2512	0,85	0,230	250	130	0,0500	M.D	77/150
up to 2400 V												
MTx-165-22-F MT/Dx-165-22-F MD/Tx-165-22-F	2000÷2200	4,7	165 (85)	1,50	500	0,80	1,350	125	125	0,1800	M.F1	34/94
MTx-250-24-C1 MT/Dx-250-24-C1 MD/Tx-250-24-C1	2000÷2400	7,6	250 (85)	1,50	785	0,80	0,700	200	125	0,0650	M.C1	50/115
MTx-430-24-A2 MT/Dx-430-24-A2 MD/Tx-430-24-A2	2000÷2400	12,0	430 (85)	1,55	1256	1,00	0,410	250	125	0,0650	M.A2	60/124
MTx-740-24-D MT/Dx-740-24-D MD/Tx-740-24-D	2000÷2400	24,5	740 (77)	1,55	3140	0,90	0,210	320	125	0,0500	M.D	77/150

Part Number	V_{DRM} V_{RRM}	I_{TSM}	I_{TAV}	V_{TM}	I_{TM}	$V_{T(RO)}$ $T_{j\max}$	r_T	t_q	$T_{j\max}$	R_{thjc}	Package	Baseplate width/length [mm]
	[V]	[kA]	[T _c ,C°]	[V]	[A]	[V]	[mΩ]	[μs]	[°C]	[°C/W]		
up to 2800 V												
MTx-130-28-F	2400÷2800	3,4	130 (85)	1,80	500	0,85	2,400	160	125	0,1900	M.F1	34/94
MT/Dx-130-28-F												
MD/Tx-130-28-F												
MTx-200-28-C1	2600÷2800	5,5	200 (87)	2,00	785	0,90	1,100	200	125	0,0650	M.C1	50/115
MT/Dx-200-28-C1												
MD/Tx-200-28-C1												
MTx-400-28-A2	2600÷2800	9,0	400 (82)	1,80	1256	1,00	0,650	250	125	0,0325	M.A2	60/124
MT/Dx-400-28-A2												
MD/Tx-400-28-A2												
MTx-630-28-D	2600÷2800	21,0	630 (80)	1,40	1978	0,95	0,300	320	125	0,0500	M.D	77/150
MT/Dx-630-28-D												
MD/Tx-630-28-D												
up to 3600 V												
MTx-115-36-F	3000÷3600	2,5	115 (85)	2,45	500	0,95	3,000	200	125	0,1900	M.F1	34/94
MT/Dx-115-36-F												
MD/Tx-115-36-F												
MTx-160-36-C1	3000÷3600	4,0	160 (81)	2,50	785	1,20	2,300	300	125	0,0650	M.C1	50/115
MT/Dx-160-36-C1												
MD/Tx-160-36-C1												
MTx-320-36-A2	3000÷3600	5,5	320 (85)	2,20	785	1,15	0,800	320	125	0,0680	M.A2	60/124
MT/Dx-320-36-A2												
MD/Tx-320-36-A2												
MTx-500-36-D	3000÷3600	18,0	500 (85)	1,85	1570	1,10	0,400	400	125	0,0500	M.D	77/150
MT/Dx-500-36-D												
MD/Tx-500-36-D												
up to 4400 V												
MTx-260-44-A2	3800÷4400	5,0	260 (85)	2,30	628	1,40	1,300	500	125	0,0680	M.A2	60/124
MT/Dx-260-44-A2												
MD/Tx-260-44-A2												
MTx-400-44-D	3800÷4400	14,0	400 (88)	2,70	2512	1,20	0,650	500	125	0,0500	M.D	77/150
MT/Dx-400-44-D												
MD/Tx-400-44-D												
up to 6500 V												
MTx-240-65-A2	4600÷6500	4,0	240 (85)	2,80	785	1,10	2,500	630	125	0,0680	M.A2	60/124
MT/Dx-240-65-A2												
MD/Tx-240-65-A2												

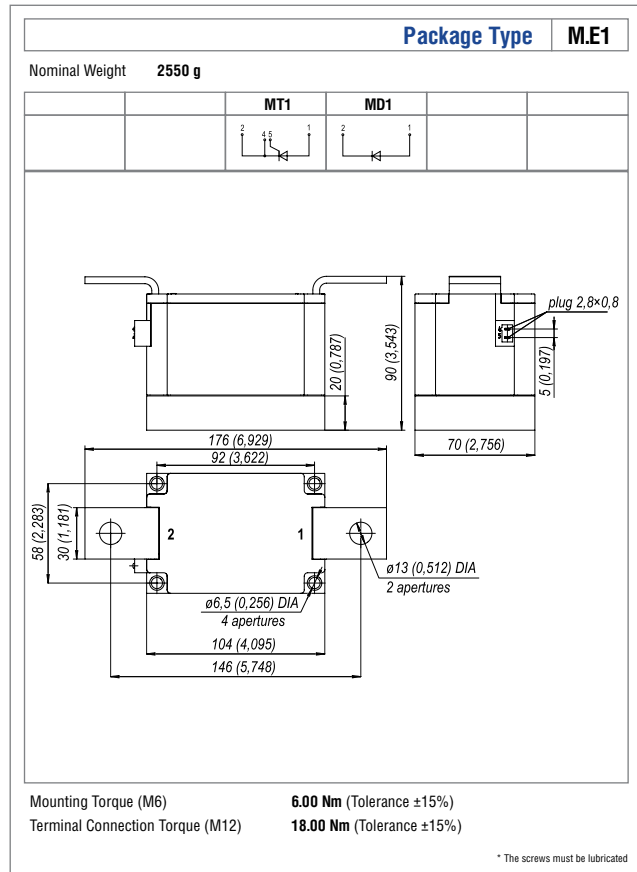
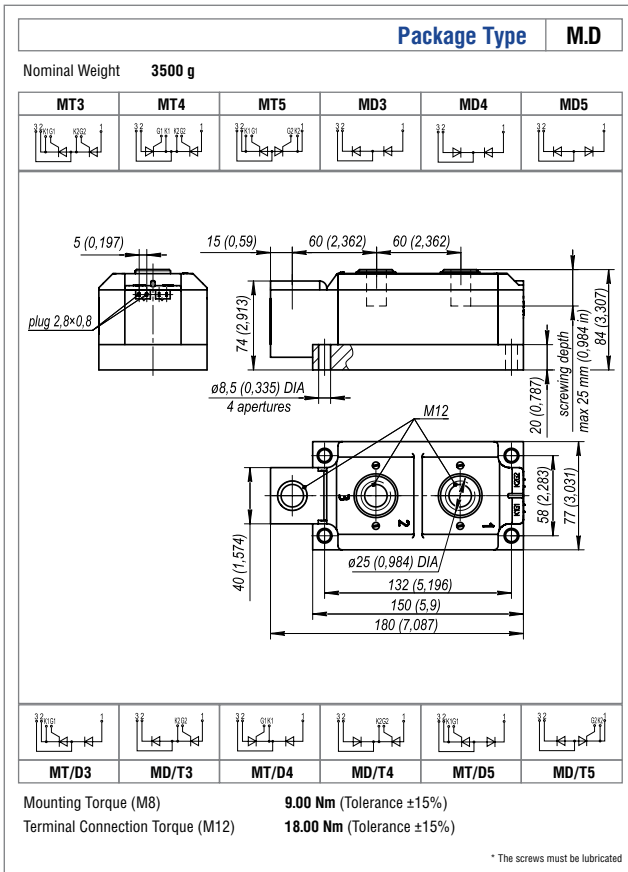
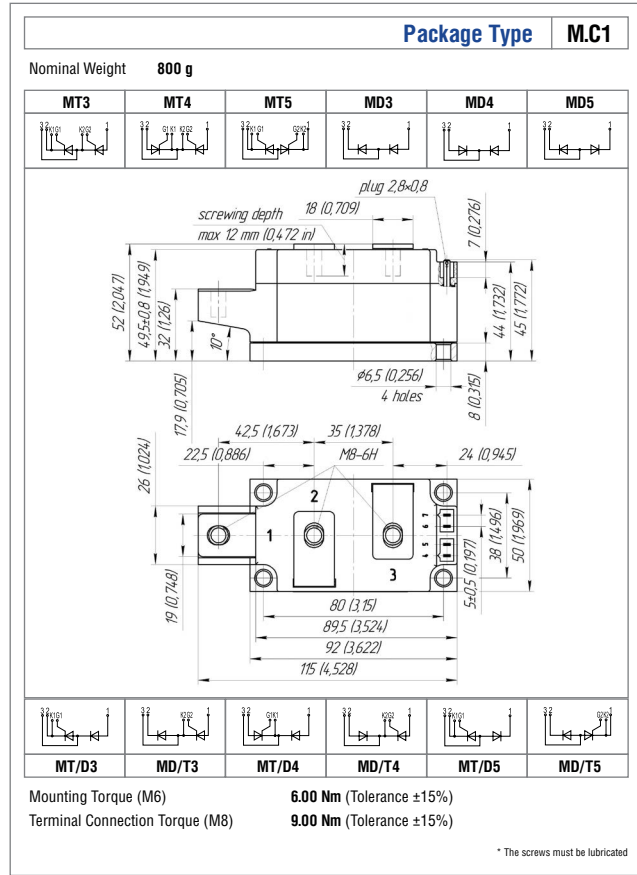
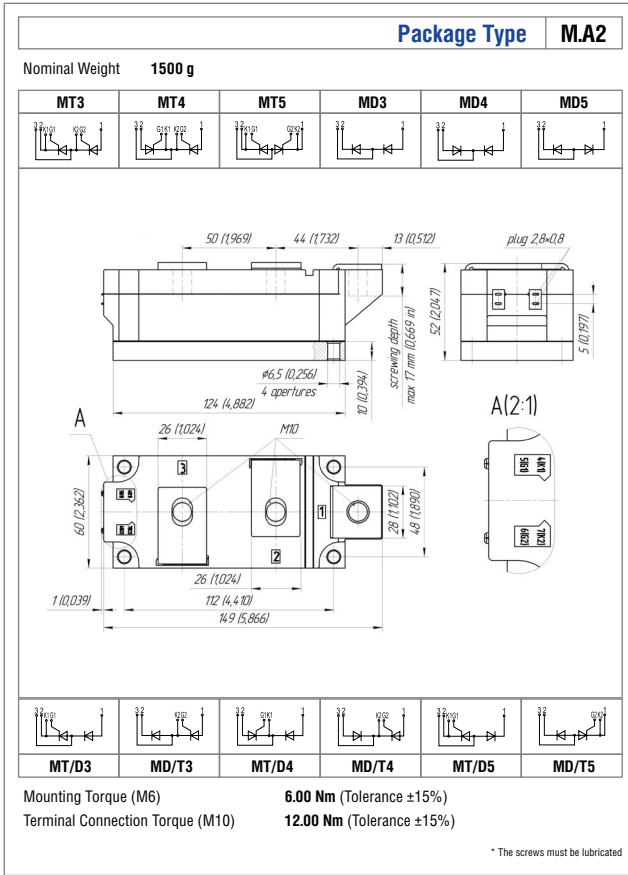


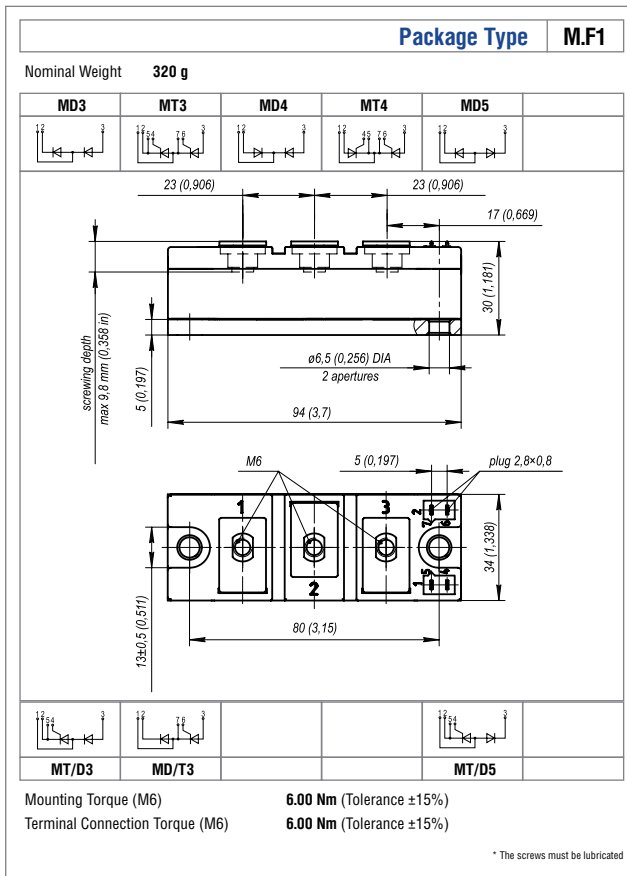
Single Component Diode Modules (MD1)

Part Number	V_{RRM}	I_{FSM}	I_{FAV}	V_{FM}	I_{FM}	$V_{T_j^{(TO)}}$	r_T	$T_{j\max}$	R_{thjc}	Package	Baseplate width/length [mm]
	[V]	[kA]	[T _c , C°]	[V]	[A]	[V]	[mΩ]	[°C]	[°C/W]		
up to 2800 V											
MD1-1125-28-E	2400÷2800	36,0	1125 (100)	1,38	3140	0,80	0,170	160	0,0420	M.E1	70/104
MD1-1280-22-E	2000÷2200	40,0	1280 (100)	1,25	3140	0,80	0,100	160	0,0420	M.E1	70/104
up to 4400 V											
MD1-950-44-E	3800÷4400	29,0	950 (100)	1,77	2512	0,85	0,280	160	0,0420	M.E1	70/104

Dual Component Diode Modules (MD)

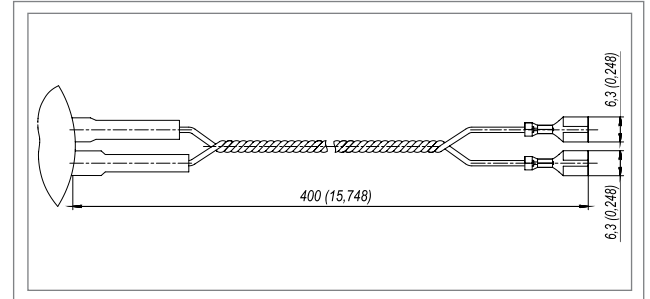
Part Number	V_{RRM}	I_{FSM}	I_{FAV}	V_{FM}	I_{FM}	$V_{T_j^{(TO)}}$	r_T	$T_{j\max}$	R_{thjc}	Package	Baseplate width/length [mm]
	[V]	[kA]	[T _c , C°]	[V]	[A]	[V]	[mΩ]	[°C]	[°C/W]		
up to 1800 V											
MDx-245-18-F	1000÷1800	8,1	245 (100)	1,30	500	0,75	0,640	150	0,1800	M.F1	34/94
MDx-400-18-C1	1000÷1800	12,0	400 (102)	1,20	785	0,75	0,250	150	0,0600	M.C1	50/115
MDx-660-18-A2	1000÷1800	19,0	660 (100)	1,40	1978	0,78	0,230	150	0,0650	M.A2	60/124
up to 2800 V											
MDx-215-22-F	2000÷2200	6,4	215 (100)	1,40	500	0,80	0,920	150	0,1800	M.F1	34/94
MDx-175-28-F	2400÷2800	6,0	175 (100)	1,50	500	0,85	1,500	150	0,1900	M.F1	34/94
MDx-320-28-C1	2000÷2800	8,5	320 (100)	1,40	785	0,85	0,450	150	0,0650	M.C1	50/115
MDx-580-26-A2	2000÷2600	14,0	580 (100)	1,50	1570	0,80	0,350	150	0,0650	M.A2	60/124
MDx-1000-28-D	2000÷2800	32,0	1000 (91)	1,38	3140	0,80	0,150	150	0,0500	M.D	77/150
up to 3600 V											
MDx-155-36-F	3000÷3600	4,5	155 (100)	2,00	500	0,93	2,000	150	0,1900	M.F1	34/94
MDx-250-36-C1	3000÷3600	5,0	250 (90)	2,00	785	0,90	1,570	150	0,0650	M.C1	50/115
MDx-515-36-A2	3000÷3600	13,0	515 (100)	1,60	1256	0,80	0,500	150	0,0680	M.A2	60/124
up to 4400 V											
MDx-470-44-A2	3800÷4400	12,0	470 (100)	1,70	1256	0,85	0,600	150	0,0680	M.A2	60/124
MDx-800-44-D	3800÷4400	23,0	800 (85)	1,77	2512	0,90	0,370	150	0,0500	M.D	77/150
up to 6500 V											
MDx-380-52-A2	4600÷5200	8,0	380 (100)	2,20	1570	0,80	0,800	140	0,0680	M.A2	60/124
MDx-320-65-A2	5400÷6500	6,0	320 (100)	2,40	1570	0,95	1,100	140	0,0680	M.A2	60/124



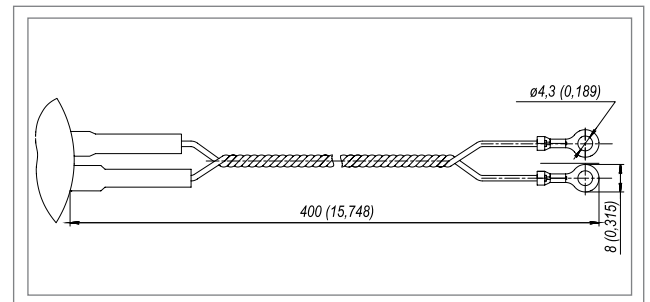


Available wire connections

Wired connection of disc devices

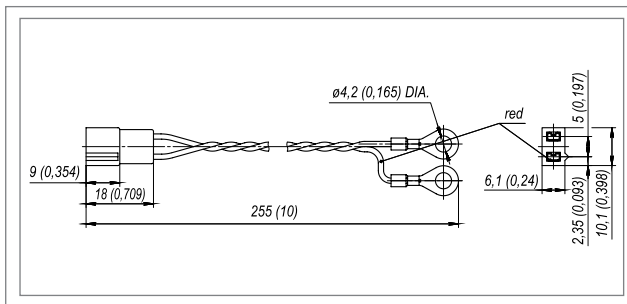


Wired connection of disc devices



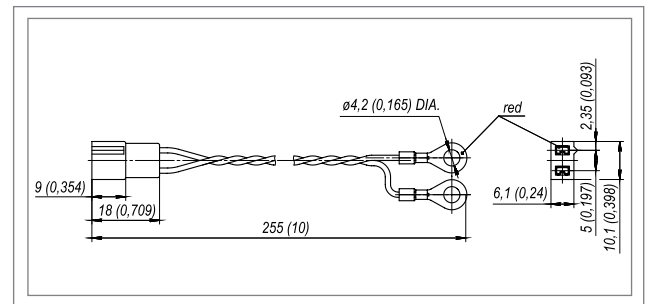
Wired connection to the module connection wire-assembly №18 (left)

- A1, A2: MT/T 3, 4, 5; MT/D 3, 4, 5
- F1: MT/T 3, 4; MT/D 3, 5
- C: MT/T 3, 4, 5; MD/T 3, 4, 5
- D: MT/T 3, 4, 5; MT/D 3, 4, 5



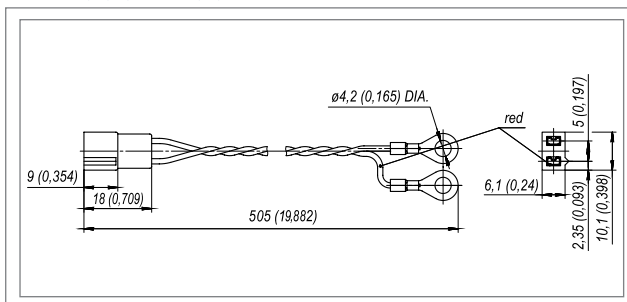
Wired connection to the module connection wire-assembly №18-01 (right)

- A2: MT/T 3, 4, 5; MD/T 3, 4, 5
- F1: MT/T 3, 4; MD/T 3 E1: MT1
- C1: MT/T 3, 4, 5; MT/D 3, 4, 5
- D: MT/T 3, 4, 5; MD/T 3, 4, 5



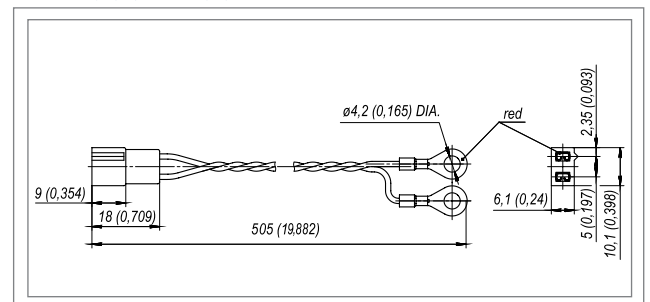
Wired connection to the module connection wire-assembly №18-02 (left)

- A2: MT/T 3, 4, 5; MT/D 3, 4, 5
- F1: MT/T 3, 4; MT/D 3, 5
- C1: MT/T 3, 4, 5; MD/T 3, 4, 5
- D: MT/T 3, 4, 5; MT/D 3, 4, 5



Wired connection to the module connection wire-assembly №18-03 (right)

- A2: MT/T 3, 4, 5; MD/T 3, 4, 5
- F1: MT/T 3, 4; MD/T 3 E1: MT1
- C1: MT/T 3, 4, 5; MT/D 3, 4, 5
- D: MT/T 3, 4, 5; MD/T 3, 4, 5



Heatsinks

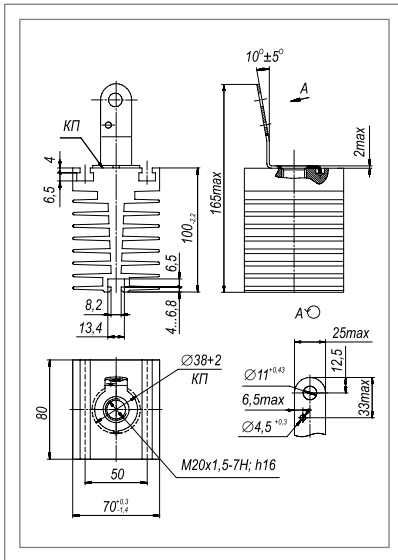
Type	Weight (without current lead)	Screw hole diameter (Diameter of the contact surface)	Overall dimensions without current lead (width/length/height)	Heat resistance (Dissipation capacity) natural cooling	Heat resistance Air speed is 6 m/sec	Pressure Differential
	[kg]	[mm]	[mm]	[°C/W (W)]	[°C/W]	[Pa]
0171	0,669 (0,63)	M20x1,5	70x80x100	1,120 (80)	0,355	18
0271	1,539 (1,5)	M20x1,5	110x110x100	0,710 (130)	0,236	25
0371	0,404 (0,365)	M20x1,5	45x80x80	1,900 (50)	0,670	15
0181	0,672 (0,62)	M24x1,5	70x80x100	1,120 (80)	0,355	18
0281	1,542 (1,49)	M24x1,5	110x110x100	0,710 (130)	0,236	25
0123	1,58 (1,45)	(22)	126x100x122	0,710 (120)	0,212	20
0143	3,18 (2,85)	(42)	135x150x125	0,500 (120)	0,125	30
0243	5,56 (4,76)	(42)	170x150x170	0,280 (220)	0,080	30
0343	5,26 (4,46)	(42)	170x150x150	0,355 (220)	0,100	30
0153	5,57 (4,77)	(55)	170x150x176	0,280 (220)	0,075	30
0253	5,27 (4,47)	(55)	170x150x156	0,355 (220)	0,100	30
0173	12,18 (10,57)	(82)	200x250x210	0,180 (400)	0,050	40
0193	22,9(22,0)	100	300x300x213	0,101 (400)	0,03	29

Part Numbering guide

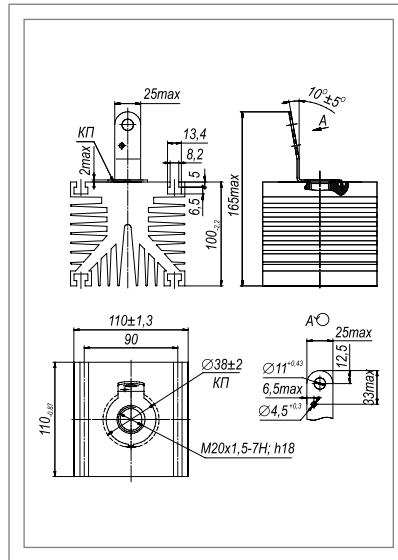
0	221	-	60	-	N
1	2		3		4

1. 0 — Heatsink
2. Design version
3. Length, mm
4. Ambient conditions

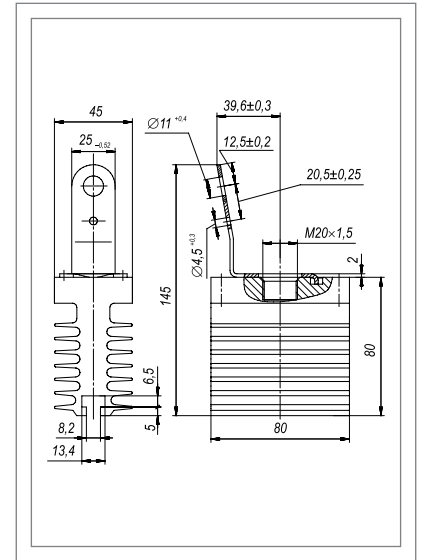




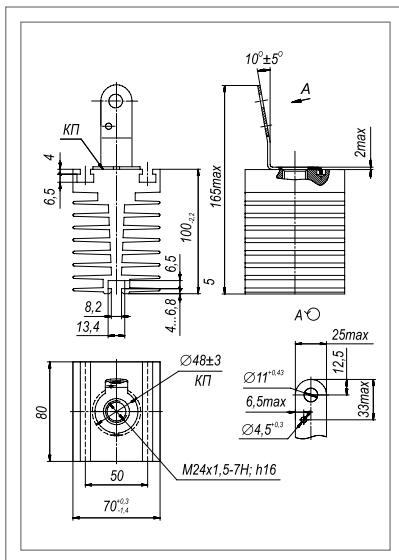
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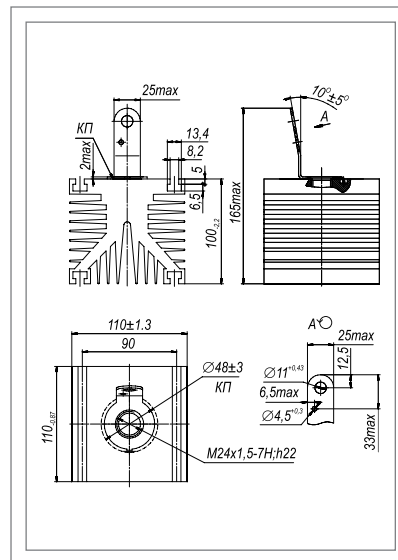
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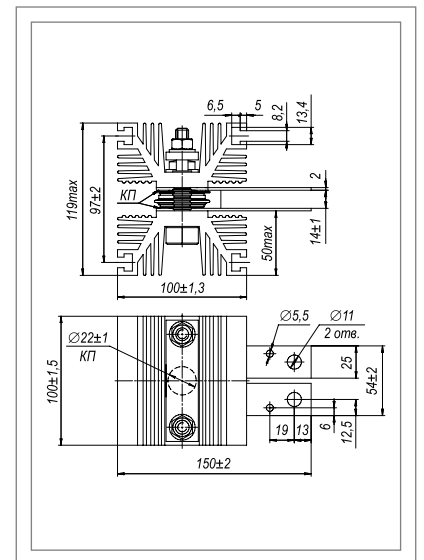
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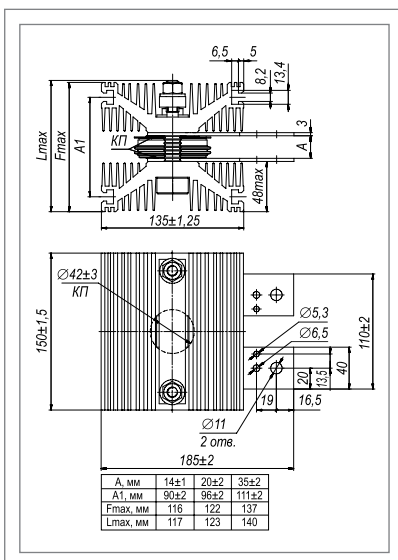
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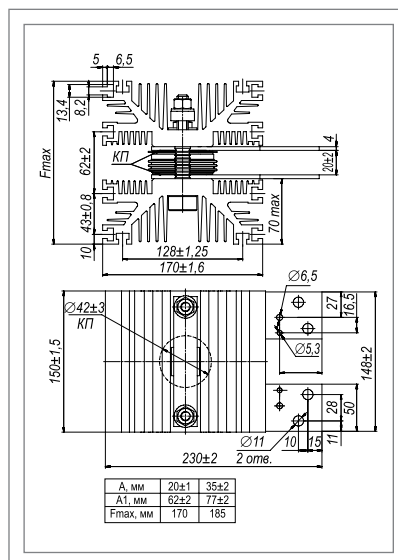
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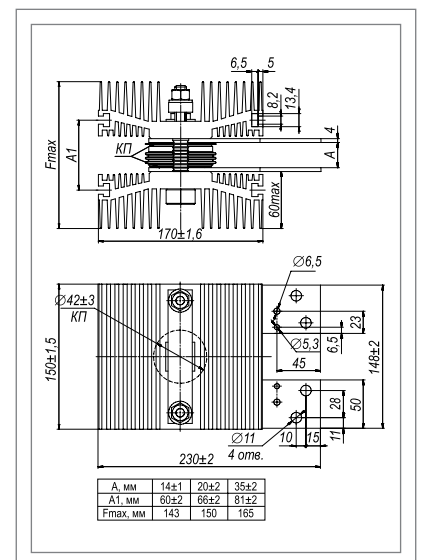
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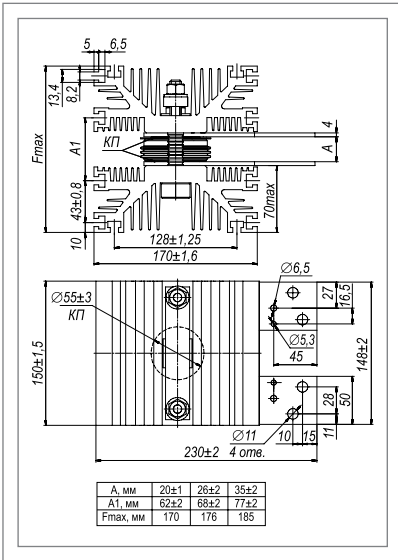
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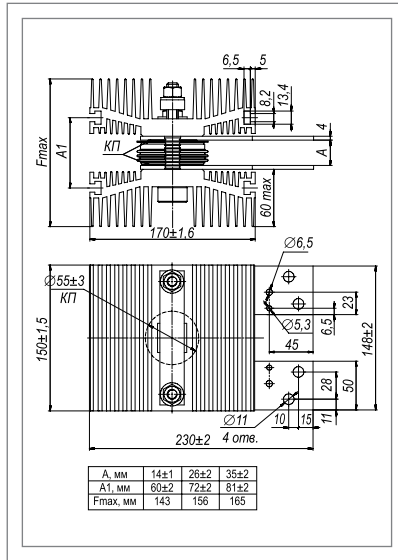
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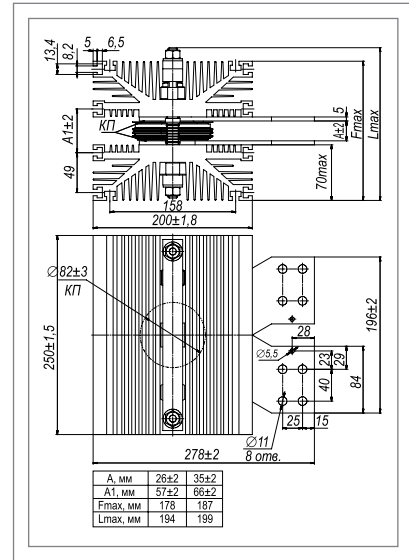
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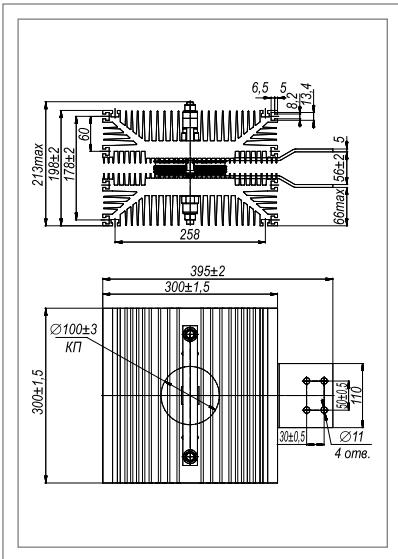
0153



0253




0173



0193

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