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**POWER SEMICONDUCTOR DEVICES  
SHORT FORM CATALOG**





**estel**

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# TALLINN ELECTRICAL ENGINEERING FACTORY ESTEL AS

Tallinna Elektrotehnika Tehas «Estel» AS was established in 1870. Today, it is one of the world leaders in the field of development, production and sales of a wide spectrum of power converter equipment and power semiconductor devices.

In modern history, the company Tallinna Elektrotehnika Tehas "Estel" AS has been known in the market under the name "Kalinin's Tallinn Electrotechnical Plant" and the Scientific and Production Association " Elektrotehnika".

The company has 50 years' experience in the development, production and evaluation of the results of operation of power semiconductor devices. During this period more than 35 million diodes, thyristors and surge suppressors were produced.

The company has highly qualified specialists with experience on the international market of power electronics and test equipment which allows to conduct both serial production and research work.

The company's various converter devices, has been successfully operating in the energy, transport, metallurgy and other industries.

A wide range of power semiconductor devices manufactured by the company is different from commercially available analogues, not only by more competitive price, but also by a high level of quality and reliability.

Company specialists provide expert assistance to consumers in a very different ways. If necessary, devices can be selected by the static and dynamic parameters for each specific facility. This ensures quality and durability of each device.

The enterprise has a quality management system in accordance with the international standard ISO 9001, ISO 14001, ISO 45001.

The company Tallinna Elektrotehnika Tehas "Estel" AS – it is an EXPERIENCE, SCIENCE and QUALITY!





■ Device code	5
■ THYRISTORS	6
■ Letter symbols for thyristors	7
■ Group codes for thyristors	8
■ Fast Thyristors	9
■ Fast Distributed Gate Thyristors	10
■ Fast Strong Distributed Gate Thyristors	11
■ Phase Control Thyristors	16
■ Avalanche Thyristors	17
■ Thyristor outlines	18
■ DIODES	26
■ Letter symbols for diodes	28
■ Group codes for diodes	29
■ Fast Recovery Diodes	30
■ Rectifier Diodes	32
■ Avalanche Diodes	33
■ Surge Voltage Suppressors	34
■ Diod outlines	35
■ HEATSINKS	40
■ Air-cooled heatsinks for threaded stud designs	41
■ Air-cooled heatsinks for press pack designs	42
■ Water-cooled heatsinks for press pack designs	43
■ Heatsink outlines	44

Phase control thyristors

**T**

Avalanche thyristors

**TL**

Fast thyristors

**TF**

Fast distributed gate thyristors

**TFI**

Rectifier diodes

**D**

Avalanche diodes

**DL**

Fast recovery diodes

**DF**

Surge voltage suppressors

**DAS**

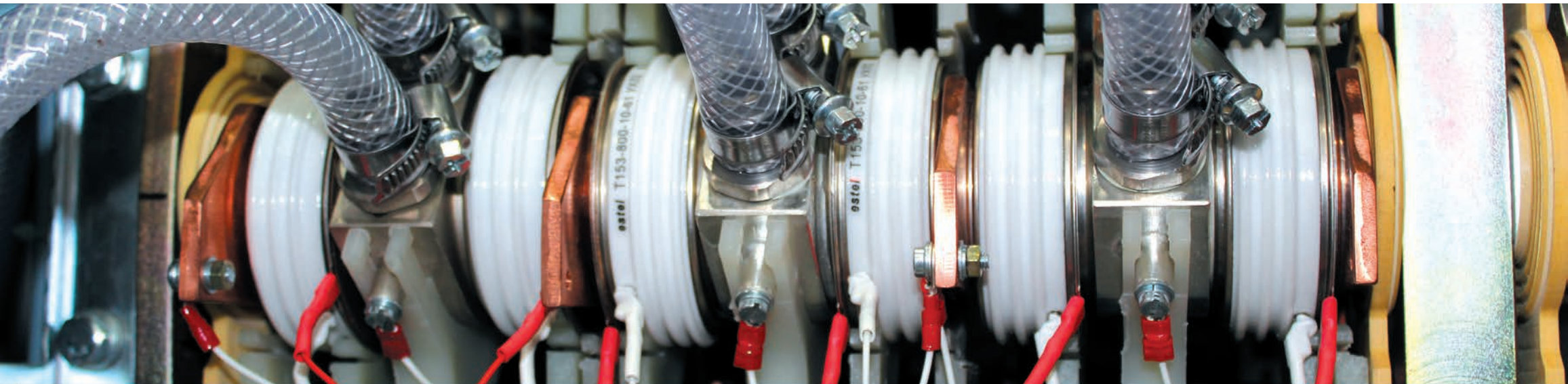
## Thyristors

### Key features:

- Compliance with international standards;
- High quality level;
- Particularly high cyclical resistance by means of pressure design;
- Internal control signal amplification;
- Hermetic metal-to-ceramic package.

### Additional features:

- Carrying out selection of devices into groups for parallel, serial, or mixed connection;
- Manufacture of devices on the special requirements of the customer;
- Supply of the devices in assembly with the cooler.



$U_{DRM}$	Repetitive peak off-state voltage
$U_{RRM}$	Repetitive peak reverse voltage
$I_{TAV}$	Mean on-state current
$I_{TRMS}$	RMS on-state current
$I_{TSM}$	Surge on-state current
$I^2t$	Limiting load integral
$T_{vj}$	Junction temperature
$T_{stg}$	Storage temperature
$T_c$	Case temperature
$M$	Tightening torque
$F$	Mounting force
$U_{TM}$	Peak on-state voltage
$U_{T(T0)}$	Threshold voltage
$r_T$	On-state slope voltage
$I_{RRM}$	Repetitive peak reverse current
$I_{DRM}$	Repetitive peak off-state current
$I_L$	Latching current
$I_H$	Holding current
$U_{GT}$	Gate trigger direct voltage
$I_{GT}$	Gate trigger direct current
$U_{GD}$	Gate non-trigger direct voltage
$I_{GD}$	Gate non-trigger direct current
$U_{RGM}$	Peak reverse gate voltage
$(du_D/dt)_{crit}$	Critical rate of rise of off-state voltage
$(di_T/dt)_{crit}$	Critical rate of rise of on-state current
$t_{gd}$	Delay time
$t_{gt}$	Turn-on time
$t_q$	Turn-off time
$Q_{rr}$	Recovered charge
$t_{rr}$	Reverse recovery time
$I_{RRM}$	Peak reverse recovery current
$P_{RSM}$	Surge reverse power dissipation
$R_{thjc}$	Thermal resistance junction to case



## GROUP CODES OF THYRISTORS

Symbol of group	0	P3	E3	A3	P2	K2	E2	A2	T1	P1	M1
	0	1	2	3	4	5	6	7	8	-	9
$(du/dt)_{crit}, V/\mu s$	Not limited	20	50	100	200	320	500	1000	1600	2000	2500

$t_q$  (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

$t_q$  (fast thyristors)

Symbol of group	0	C3	E3	H3	K3	M3	P3	T3	X3	A4	B4	C4	E4	K4
	0	1	2	3	4	5	6	7	8	-	9	-	-	-
$t_q, \mu s$	Not limited	63	50	40	32	25	20	16	12,5	10	8	6,3	5	3,2

Symbol of group	0	T3	A4	B4	C4	H4	K4	M4	P4	T4	X4	A5	C5
	0	-	-	-	-	1	2	3	4	5	6	7	8
$t_{qt}, \mu s$	Not limited	16	10	8	6,3	4	3,2	2,5	2	1,6	1,25	1	0,63

<b>2000 V</b>					TF 353-800 TF 353-1000
<b>1500 V</b>					TF 253-800 TF 253-1000 TF 153-1000 TF 153-1250
<b>1400 V</b>	TF 251-80 TF 251-100	TF 261-125 TF 261-160	TF 271-200 TF 271-250 TF 233-400 TF 233-500	TF 243-500 TF 243-630	
<b>U<sub>DRM</sub>, U<sub>RRM</sub> / ∅</b>	<b>19 mm</b>	<b>24 mm</b>	<b>30 mm</b>	<b>38 mm</b>	<b>52 mm</b>

## Order

<b>1.</b>	<b>2.</b>	<b>3.</b>	<b>4.</b>	<b>5.</b>	<b>6.</b>	<b>7.</b>
TF	153	1000	14	7	5	1

1. Fast thyristor
2. Design version
3. Mean on-state current, A
4. Voltage code (14=1400V)
5. Critical rate of rise of off-state voltage (6≥500 V/μs, 7≥1000 V/μs)
6. Group of turn-off time (du/dt=50 V/μs, 1≤63 μs, 2≤50 μs, 3≤40 μs, 4≤32 μs, 5≤25 μs, 6≤20 μs)
7. Group of turn-on time (1≤4,0μs, 2≤3,2μs)

# FAST THYRISTORS

Type	UDRM, URRM	ITAV (TC, °C)	ITSM (10ms)	UTM/ITM (25°C)	UT(TO)	RT	tq (50V/μs)	tgt (25°C)	(di/dt)crit non-rep/rep	(du/dt)crit	IGT/UGT	Rthjc	Tjmax	Fig.
	V	A	kA	V / A	V	mΩ	μs	μs	A / μs	V / μs	A / V	°C / W	°C	
TF 251-80	600 ÷ 1400	80 (90)	1,6	2,2/251	1,45	3	20; 25	3,2	1000 / 400	500; 1000	0,2 / 2,5	0,21	125	1
TF 251-100	600 ÷ 1400	100 (90)	2,0	1,8/314	1,30	1,5	20; 25	3,2	1000 / 400	500; 1000	0,2 / 2,5	0,21	125	1
TF 261-125	600 ÷ 1400	125 (88)	3,5	2,2/392	1,45	2,5	20; 25; 32	3,2	1000 / 400	500; 1000	0,25 / 2,5	0,12	125	2
TF 261-160	600 ÷ 1400	160 (88)	4,0	1,8/502	1,20	1,8	20; 25; 32	3,2	1000 / 400	500; 1000	0,25 / 2,5	0,12	125	2
TF 271-200	600 ÷ 1400	200 (90)	6,0	2,2/628	1,38	1,5	25; 32; 40	3,2	1000 / 400	500; 1000	0,3 / 2,5	0,075	125	3
TF 271-250	600 ÷ 1400	250 (90)	7,0	1,8/725	1,20	0,97	25; 32; 40	3,2	1000 / 400	500; 1000	0,3 / 2,5	0,075	125	3
TF 233-400	600 ÷ 1400	400 (82)	6,5	2,7/1256	1,50	0,92	20; 25; 32; 40	3,2	1000 / 400	500; 1000	0,3 / 2,5	0,045	125	7
TF 233-500	600 ÷ 1400	500 (88)	7,5	2,25/1570	1,00	0,5	25; 32; 40; 50	3,2	1000 / 400	500; 1000	0,3 / 2,5	0,045	125	7
TF 243-500	600 ÷ 1400	500 (82)	9,0	2,6/1570	1,25	1	25; 32; 40; 50	3,2	1000 / 500	500; 1000	0,3 / 2,5	0,035	125	8
TF 243-630	600 ÷ 1400	630 (82)	10,5	2,1/1978	1,42	0,34	25; 32; 40; 50	3,2	1000 / 500	500; 1000	0,3 / 2,5	0,035	125	8
TF 153-1000	800 ÷ 1500	1000 (82)	20,0	2,5/3140	1,20	0,34	20; 25; 32; 40	4,0	2000 / 1250	500; 1000	0,3 / 2,5	0,021	125	9
TF 153-1250	800 ÷ 1500	1250 (82)	21,0	2,1/3925	1,00	0,21	25; 32; 40	4,0	2000 / 1250	500; 1000	0,3 / 2,5	0,021	125	9
TF 253-800	800 ÷ 1500	800 (85)	20,0	2,35/2512	1,20	0,4	25; 32; 40	4,0	2000 / 1250	500; 1000	0,3 / 2,5	0,025	125	10
TF 253-1000	800 ÷ 1500	1000 (85)	21,0	2,1/3140	1,10	0,2	25; 32; 40	4,0	2000 / 1250	500; 1000	0,3 / 2,5	0,025	125	10
TF 353-800	1200 ÷ 2000	800 (82)	17,0	2,8/2512	1,40	0,58	32; 40; 50	4,0	2000 / 1250	500; 1000	0,3 / 2,5	0,021	125	9
TF 353-1000	1200 ÷ 2000	1000 (82)	18,0	2,35/3140	1,18	0,35	40; 50; 63	4,0	2000 / 1250	500; 1000	0,3 / 2,5	0,021	125	9

<b>4400 V</b>				TFI 473-1600	
<b>3400 V</b>			TFI 353-800		
<b>2800 V</b>			TFI 353-1000		TFI 393-2500
<b>2200 V</b>	TFI 371-200	TFI 243-400	TFI 253-800	TFI 273-2000	
	TFI 333-320	TFI 343-500	TFI 253-1000		
<b>1500 V</b>	TFI 272-200	TFI 143-400	TFI 153-1000		
		TFI 243-500	TFI 153-1250		
		TFI 243-630			
<b>1400 V</b>				TFI 173-2000	
<b>1100 V</b>	TFI 172-200				
	TFI 171-250				
	TFI 171C250				
	TFI 133-400				
<b>U<sub>DRM</sub>, U<sub>RRM</sub> / D</b>	<b>30 mm</b>	<b>38 mm</b>	<b>52 mm</b>	<b>80 mm</b>	<b>100 mm</b>

## Order

<b>1.</b>	<b>2.</b>	<b>3.</b>	<b>4.</b>	<b>5.</b>	<b>6.</b>	<b>7.</b>
TFI	153	1000	14	7	7	2

1. Fast distributed gate thyristors
2. Design version
3. Mean on-state current, A
4. Voltage code (14=1400V)
5. Critical rate of rise of off-state voltage (6≥500 V/μs, 7≥1000 V/μs)
6. Group of turn-off time (du/dt=50 V/μs, T2≤160 μs, X2≤125 μs, A3≤100 μs, B3≤80 μs, 1≤63 μs, 2≤50 μs, 3≤40 μs, 4≤32 μs, 5≤25 μs, 6≤20 μs, 7≤16 μs, 8≤12,5 μs, A4≤10 μs, 9≤8 μs)
7. Group of turn-on time (1≤4,0μs, 2≤3,2μs, 3≤2,5μs)

# FAST DISTRIBUTED GATE THYRISTORS

Type	UDRM, URRM	ITAV (TC, °C)	ITSM (10ms)	UTM/ITM (25°C)	UT(TO)	RT	tq (50V/μs)	tgt (25°C)	(di/dt)crit non-rep/rep	(du/dt)crit	IGT/UGT	Rthjc	Tjmax	Fig.
	V	A	kA	V / A	V	mΩ	μs	μs	A / μs	V / μs	A / V	°C / W	°C	
TFI 171-250	300 ÷ 1100	250 (90)	8,0	2,1/785	1,35	0,8	8; 10; 12,5; 16	2,5	1600 / 800	500; 1000	0,3 / 2,5	0,075	125	3
TFI 171C250	300 ÷ 1100	250 (90)	8,0	2,1/785	1,35	0,8	8; 10; 12,5; 16	2,5	1600 / 800	500; 1000	0,3 / 2,5	0,075	125	4
TFI 172-200	300 ÷ 1100	200 (95)	6,0	2,1/628	1,40	0,75	12,5; 16; 20	2,5	1600 / 800	500; 1000	0,3 / 2,5	0,075	125	5
TFI 272-200	800 ÷ 1500	200 (85)	6,0	2,3/628	1,45	1,5	16; 20; 25; 32	2,5	1600 / 800	500; 1000	0,3 / 2,5	0,075	125	5
TFI 371-200	1200 ÷ 2200	200 (85)	6,3	2,3/628	1,50	1,22	20; 25; 32	2,5	1600 / 800	500; 1000	0,3 / 2,5	0,075	125	3
TFI 133-400	300 ÷ 1100	400 (90)	8,0	2,4/1256	1,40	0,72	8; 10; 12,5; 16	2,5	1600 / 800	500; 1000	0,3 / 2,5	0,040	125	7; 11
TFI 333-320	1200 ÷ 2200	320 (85)	6,3	2,6/1005	1,60	1,25	20; 25; 32	2,5	1600 / 800	500; 1000	0,3 / 2,5	0,045	125	7; 11
TFI 143-400	800 ÷ 1500	400 (90)	10,0	2,6/1256	1,60	0,82	6,3; 8; 10	2,5	2000 / 1250	500; 1000	0,3 / 2,5	0,032	125	8; 11
TFI 243-400	1200 ÷ 2200	400 (88)	9,0	2,75/1256	1,70	1,1	20; 25; 32	2,5	2000 / 1250	500; 1000	0,3 / 2,5	0,032	125	8; 11
TFI 243-500	800 ÷ 1500	500 (85)	10,0	2,4/1570	1,45	0,7	12,5; 16; 20; 25	2,5	2000 / 1250	500; 1000	0,3 / 2,5	0,032	125	8; 11
TFI 243-630	800 ÷ 1500	630 (80)	11,0	2,3/1978	1,30	0,57	16; 20; 25	2,5	2000 / 1250	500; 1000	0,3 / 2,5	0,032	125	8; 11
TFI 343-500	1200 ÷ 2200	500 (85)	10,0	2,4/1570	1,50	0,62	20; 25; 32	2,5	2000 / 1250	500; 1000	0,3 / 2,5	0,034	125	8; 11
TFI 153-1000	800 ÷ 1500	1000 (80)	21,0	2,25/3140	1,40	0,28	12,5; 16; 20; 25	3,2	2000 / 1250	500; 1000	0,3 / 2,5	0,021	125	9; 10
TFI 153-1250	800 ÷ 1500	1250 (70)	22,0	2,1/3925	1,28	0,24	16; 20; 25; 32	3,2	2000 / 1250	500; 1000	0,3 / 2,5	0,021	125	9; 10
TFI 253-800	1200 ÷ 2200	800 (85)	18,0	2,5/2512	1,50	0,43	20; 25; 32; 40	3,2	2000 / 1250	500; 1000	0,3 / 2,5	0,021	125	10
TFI 253-1000	1200 ÷ 2200	1000 (75)	20,0	2,35/3140	1,40	0,33	20; 25; 32; 40	3,2	2000 / 1250	500; 1000	0,3 / 2,5	0,021	125	10
TFI 353-800	2200 ÷ 3400	800 (80)	17,0	2,6/2512	1,52	0,52	50; 63; 80; 100	4,0	2000 / 1250	500; 1000	0,3 / 2,5	0,021	125	10
TFI 353-1000	2200 ÷ 2800	1000 (78)	19,0	2,25/3140	1,35	0,35	32; 40	4,0	2000 / 1250	500; 1000	0,3 / 2,5	0,021	125	10
TFI 173-2000	800 ÷ 1400	2000 (85)	40,0	2,0/6280	1,28	0,09	16; 20; 25	4,0	2000 / 1250	500; 1000	0,35 / 2,5	0,011	125	12; 13
TFI 273-2000	1200 ÷ 2200	2000 (80)	40,0	2,1/6280	1,30	0,125	32; 40; 50	4,0	1600 / 1000	500; 1000	0,35 / 2,5	0,011	125	12; 13
TFI 473-1600	3400 ÷ 4400	1600 (77)	30,0	2,7/5024	1,44	0,27	125; 160	4,0	1600 / 800	500; 1000	0,35 / 2,5	0,012	125	12; 13
TFI 393-2500	2200 ÷ 2800	2500 (88)	66,0	2,4/7850	1,45	0,125	63; 80; 100	4,0	1600 / 800	500; 1000	0,6 / 2,5	0,0065	125	14



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# OVERVIEW FAST STRONG DISTRIBUTED GATE THYRISTORS

1400 V			TFI 153S-800	
			TFI 153S-1000	
1200 V	TFI 133S-400			TFI 173S-1250
1100 V		TFI 143S-500		
$U_{DRM}, U_{RRM} / D$	32 mm	40 mm	56 mm	80 mm

## Order

1.	2.	3.	4.	5.	6.	7.
TFI	153	1000	14	7	7	2

1. Fast distributed gate thyristors
2. Design version
3. Strong distributed amplified gate
4. Mean on-state current, A
5. Voltage code (12=1200V)
6. Critical rate of rise of off-state voltage ( $6 \geq 500 \text{ V}/\mu\text{s}$ ,  $7 \geq 1000 \text{ V}/\mu\text{s}$ )
7. Group of turn-off time ( $du/dt=50 \text{ V}/\mu\text{s}$ ,  $8 \leq 12,5 \mu\text{s}$ ,  $A4 \leq 10 \mu\text{s}$ ,  $9 \leq 8 \mu\text{s}$ ,  $C4 \leq 6,3 \mu\text{s}$ ,  $E4 \leq 5 \mu\text{s}$ )
8. Group of turn-on time ( $3 \leq 2,5 \mu\text{s}$ )

Type	$U_{DRM}, U_{RRM}$	$I_{TAV}$ ( $T_c, ^\circ\text{C}$ )	$I_{TSM}$ (10ms)	$U_{TM}/I_{TM}$ ( $25^\circ\text{C}$ )	$U_{T(TO)}$	$R_T$	$t_q$ ( $50\text{V}/\mu\text{s}$ )	$t_{gt}$ ( $25^\circ\text{C}$ )	$(di/dt)_{crit}$ non-rep/rep	$(du/dt)_{crit}$	$I_{GT}/U_{GT}$	$R_{thjc}$	$T_{jmax}$	Fig.
	V	A	kA	V / A	V	m $\Omega$	$\mu\text{s}$	$\mu\text{s}$	A / $\mu\text{s}$	V / $\mu\text{s}$	A / V	$^\circ\text{C} / \text{W}$	$^\circ\text{C}$	
TFI 133S-400	600 ÷ 1200	400 (81)	6,5	3,0/1256	1,80	0,95	5; 6,3	2,5	1600 / 1000	500; 1000	0,4 / 2,5	0,040	125	11
TFI 143S-500	300 ÷ 1100	500 (85)	9,0	2,4/1570	1,45	0,71	5; 6,3	2,5	1600 / 1000	500; 1000	0,35 / 2,5	0,032	125	11
TFI 153S-800	800 ÷ 1400	800 (83)	19,0	2,6/2512	1,60	0,44	6,3; 8; 10; 12,5	2,5	1600 / 1000	500; 1000	0,35 / 2,5	0,021	125	10
TFI 153S-1000	800 ÷ 1400	1000 (78)	20,0	2,3/3140	1,45	0,29	10; 12,5	2,5	1600 / 1000	500; 1000	0,35 / 2,5	0,021	125	10
TFI 173S-1250	800 ÷ 1250	1250 (85)	28,0	2,5/3925	1,60	0,173	6,3; 8	2,5	2500 / 1250	500; 1000	1 / 2,5	0,015	125	12

6000 V					T 753-500	
4600 V				T 543-400		
4400 V					T 553-500 T 553-630	T 573-1250
4200 V					T 553-800	
3600 V				T 443-500	T 353-800 T 453-630 T 453-800	T 473-1600
3000 V				T 343-500 T 343-630		
2800 V					T 353-1000	
2600 V						T 373-2000
2400 V			T 371-320 T 333-320			
1800 V		T 161-160 T 161-200	T 271-320 T 233-500	T 243-630 T 243-800	T 253-1000 T 253-1250	T 273-2500
1600 V	T 151-100					
1000 V						T 173-3200
800 V				T 143-1000 T 143-1250	T 153-1600 T 153-2000	
$U_{DRM}, U_{RRM} / D$	19 mm	24 mm	30 mm	38 mm	56 (52) mm	80 mm

## Order

1.	2.	3.	4.	5.	6.
TF	253	1250	18	7	3

1. Phase control thyristor
2. Design version
3. Mean on-state current, A
4. Voltage code (18=1800V)
5. Critical rate of rise of off-state voltage ( $6 \geq 500 \text{ V}/\mu\text{s}$ ,  $7 \geq 1000 \text{ V}/\mu\text{s}$ )
6. Group of turn-off time ( $du/dt=50 \text{ V}/\mu\text{s}$ ,  $C2 \leq 630 \mu\text{s}$ ,  $1 \leq 500 \mu\text{s}$ ,  $H2 \leq 400 \mu\text{s}$ ,  $K2 \leq 320 \mu\text{s}$ ,  $2 \leq 250 \mu\text{s}$ ,  $P2 \leq 200 \mu\text{s}$ ,  $3 \leq 160 \mu\text{s}$ ,  $X2 \leq 125 \mu\text{s}$ ,  $4 \leq 100 \mu\text{s}$ )



# PHASE CONTROL THYRISTORS

Type	UDRM, URRM	ITAV (Tc, °C)	ITSM (10ms)	UTM/ITM (25°C)	UT(TO)	RT	tq (50V/μs)	(di/dt) <sub>crit</sub> non-rep/rep	(du/dt) <sub>crit</sub>	I <sub>GT</sub> /U <sub>GT</sub>	R <sub>thjc</sub>	T <sub>Jmax</sub>	Fig.
	V	A	kA	V / A	V	mΩ	μs	A / μs	V / μs	A / V	°C / W	°C	
T 151-100	800 ÷ 1600	100 (90)	2,0	1,8/314	1,10	1,8	100; 160; 250	250 / 125	500; 1000	0,2 / 2,5	0,210	125	1
T 161-160	800 ÷ 1800	160 (87)	4,5	1,7/502	1,03	1,38	100; 125; 160	250 / 125	500; 1000	0,3 / 2,5	0,150	125	6
T 161-200	800 ÷ 1800	200 (87)	5,0	1,6/628	0,84	0,96	200; 250; 320	250 / 125	500; 1000	0,3 / 2,5	0,130	125	6
T 271-320	1000 ÷ 1800	320 (90)	9,0	1,6/1005	1,00	0,5	100; 125; 160	320 / 160	500; 1000	0,3 / 2,5	0,075	125	3
T 371-320	1600 ÷ 2400	320 (85)	9,0	1,8/1005	1,10	0,7	125; 160; 250	320 / 160	500; 1000	0,3 / 2,5	0,075	125	3
T 233-500	1000 ÷ 1800	500 (87)	9,0	1,75/1570	1,22	0,34	125; 160; 250	320 / 160	500; 1000	0,3 / 2,5	0,045	125	7; 15; 11
T 333-320	1600 ÷ 2400	320 (97)	8,0	1,9/1005	1,20	0,85	100; 125; 160	320 / 160	500; 1000	0,3 / 2,5	0,045	125	7; 15; 11
T 143-1000	200 ÷ 800	1000 (94)	19,0	1,6/3140	0,90	0,24	125; 160; 250	400 / 200	500; 1000	0,3 / 2,5	0,030	140	8
T 143-1250	200 ÷ 800	1250 (83)	20,0	1,6/3925	0,95	0,2	125; 160; 250	400 / 200	500; 1000	0,3 / 2,5	0,029	140	8
T 243-630	1000 ÷ 1800	630 (90)	14,0	1,8/1978	1,10	0,35	100; 160; 250	400 / 200	500; 1000	0,3 / 2,5	0,030	125	8; 16; 11
T 243-800	1000 ÷ 1800	800 (85)	15,0	1,8/2512	1,05	0,31	100; 160; 250	400 / 200	500; 1000	0,3 / 2,5	0,030	125	8; 16; 11
T 343-500	2000 ÷ 3000	500 (88)	8,0	2,3/1570	1,30	0,75	160; 200; 250	400 / 200	500; 1000	0,3 / 2,5	0,032	125	16; 11
T 343-630	2000 ÷ 3000	630 (77)	8,5	2,6/1978	1,23	0,77	160; 200; 250	400 / 200	500; 1000	0,3 / 2,5	0,032	125	16; 11
T 443-500	2800 ÷ 3600	500 (88)	8,0	2,1/1570	1,15	0,75	250; 320	400 / 200	500; 1000	0,3 / 2,5	0,034	125	11
T 543-400	3600 ÷ 4600	400 (88)	7,0	2,5/1256	1,35	1,25	400; 500	400 / 200	500; 1000	0,3 / 2,5	0,034	125	11
T 153-1600	200 ÷ 800	1600 (101)	33,0	1,45/5024	0,95	0,08	100; 125; 160	400 / 200	500; 1000	0,3 / 2,5	0,019	140	10; 17
T 153-2000	200 ÷ 800	2000 (95)	38,0	1,5/6280	0,92	0,075	100; 125; 160	400 / 200	500; 1000	0,3 / 2,5	0,017	140	10; 17
T 253-1000	1000 ÷ 1800	1000 (93)	27,0	1,7/3140	1,05	0,19	125; 160; 250	400 / 200	500; 1000	0,3 / 2,5	0,020	125	10
T 253-1250	1000 ÷ 1800	1250 (88)	30,0	1,6/3925	0,95	0,17	160; 250; 320	400 / 200	500; 1000	0,3 / 2,5	0,020	125	10
T 353-800	2400 ÷ 3600	800 (91)	17,0	2,2/2512	1,30	0,4	320; 400; 500	400 / 200	500; 1000	0,3 / 2,5	0,020	125	10
T 353-1000	2000 ÷ 2800	1000 (85)	20,0	2,0/3140	1,30	0,27	200; 250; 320	400 / 200	500; 1000	0,3 / 2,5	0,020	125	10
T 453-630	2400 ÷ 3600	630 (95)	15,0	2,2/1978	1,47	0,42	160; 250; 320	630 / 320	500; 1000	0,3 / 2,5	0,210	125	10
T 453-800	2400 ÷ 3600	800 (91)	17,0	2,3/2512	1,30	0,39	200; 250; 320	630 / 320	500; 1000	0,3 / 2,5	0,020	125	10
T 553-500	3400 ÷ 4400	500 (100)	13,5	2,4/1570	1,55	0,65	320; 400; 500	630 / 320	500; 1000	0,3 / 2,5	0,210	125	10
T 553-630	3400 ÷ 4400	630 (94)	14,0	2,3/1978	1,40	0,57	320; 400; 500	630 / 320	500; 1000	0,3 / 2,5	0,210	125	10
T 553-800	3400 ÷ 4200	800 (84)	15,0	2,6/2512	1,30	0,58	400; 500	630 / 320	500; 1000	0,3 / 2,5	0,210	125	10
T 753-500	5000 ÷ 6000	500 (95)	11,5	2,45/1570	1,25	1,05	500; 630	630 / 320	500; 1000	0,3 / 2,5	0,023	125	10; 18
T 173-3200	400 ÷ 1000	3200 (95)	65,0	1,5/10048	0,85	0,07	125; 160; 250	400 / 200	500; 1000	0,3 / 2,5	0,0100	140	12; 13
T 273-2500	1200 ÷ 1800	2500 (88)	50,0	1,5/7850	0,88	0,092	200; 250; 320	400 / 200	500; 1000	0,3 / 2,5	0,010	125	12; 13
T 373-2000	2000 ÷ 2600	2000 (94)	46,0	1,6/6280	0,90	0,13	250; 320; 400	400 / 200	500; 1000	0,3 / 2,5	0,010	125	12; 13
T 473-1600	3000 ÷ 3600	1600 (92)	36,0	2,05/5024	1,15	0,22	250; 320; 400	800 / 400	500; 1000	0,3 / 2,5	0,010	125	12; 13
T 573-1250	3800 ÷ 4400	1250 (98)	33,0	2,1/3925	1,20	0,3	250; 320; 500	800 / 400	500; 1000	0,3 / 2,5	0,010	125	12; 13

<b>1100 V</b>	TL 271-250
	TL 271-320
	TL 233-400
	TL 233-500
<b>U<sub>DRM</sub>, U<sub>RSM</sub> / D</b>	<b>32 (30) mm</b>

## Order

<b>1.</b>	<b>2.</b>	<b>3.</b>	<b>4.</b>	<b>5.</b>	<b>6.</b>
TL	271	320	11	7	0

1. Avalanche thyristor
2. Design version
3. Mean on-state current, A
4. Voltage code (11=1100V)
5. Critical rate of rise of off-state voltage (6≥500 V/μs, 7≥1000 V/μs)
6. Group of turn-off time (du/dt=50 V/μs, X2≤125 μs, 4≤100 μs, B3≤80 μs, 0 - not limited)

Type	U <sub>DRM</sub> , U <sub>RSM</sub>	I <sub>TAV</sub> (T <sub>c</sub> , °C)	I <sub>TSM</sub> (10ms)	U <sub>TM</sub> /I <sub>TM</sub> (25°C)	U <sub>T(TO)</sub>	R <sub>T</sub>	t <sub>q</sub> (50V/μs)	P <sub>RSM</sub> (10μs)	(di/dt) <sub>crit</sub> non-rep/rep	(du/dt) <sub>crit</sub>	I <sub>GT</sub> /U <sub>GT</sub>	R <sub>thjc</sub>	T <sub>Jmax</sub>	Fig.
	V	A	kA	V / A	V	mΩ	μs	kW	A / μs	V / μs	A / V	°C / W	°C	
TL 271-250	600 ÷ 1100	250 (104)	8,0	1,9/785	1,20	0,9	80; 100; 125	40,0	250 / 125	500; 1000	0,3 / 2,5	0,080	140	3
TL 271-320	600 ÷ 1100	320 (104)	9,0	1,62/1005	0,90	0,63	80; 100; 125	40,0	250 / 125	500; 1000	0,3 / 2,5	0,080	140	3
TL 233-400	600 ÷ 1100	400 (102)	8,0	2,2/1256	1,20	0,9	80; 100; 125	40,0	250 / 125	500; 1000	0,3 / 2,5	0,045	140	7
TL 233-500	600 ÷ 1100	500 (102)	9,0	1,9/1570	0,90	0,63	80; 100; 125	40,0	250 / 125	500; 1000	0,3 / 2,5	0,045	140	7

Figure 1  
 Tightening torque:  $12 \pm 18$  Nm  
 Weight: 150 g

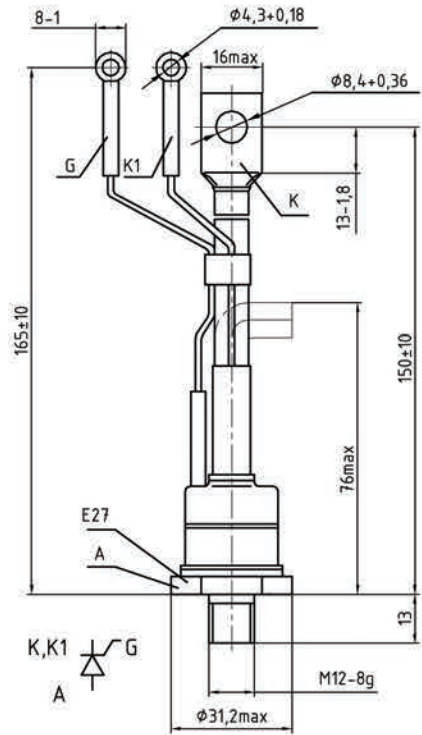


Figure 2  
 Tightening torque:  $24 \pm 36$  Nm  
 Weight: 260 g

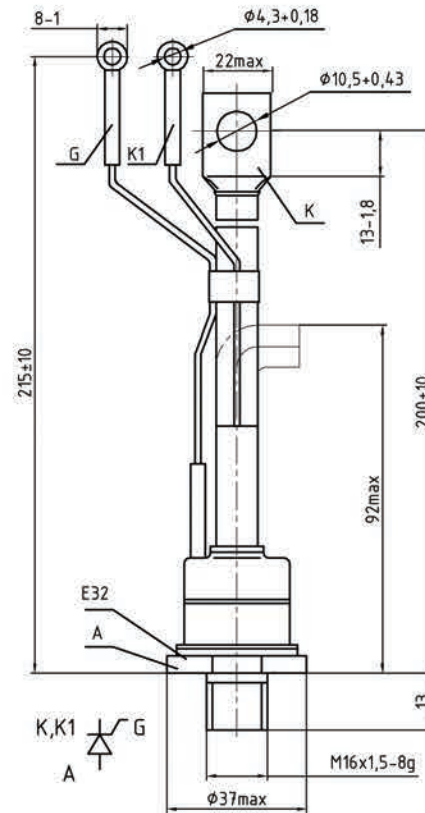


Figure 3  
 Tightening torque:  $40 \pm 60$  Nm  
 Weight: 480 g

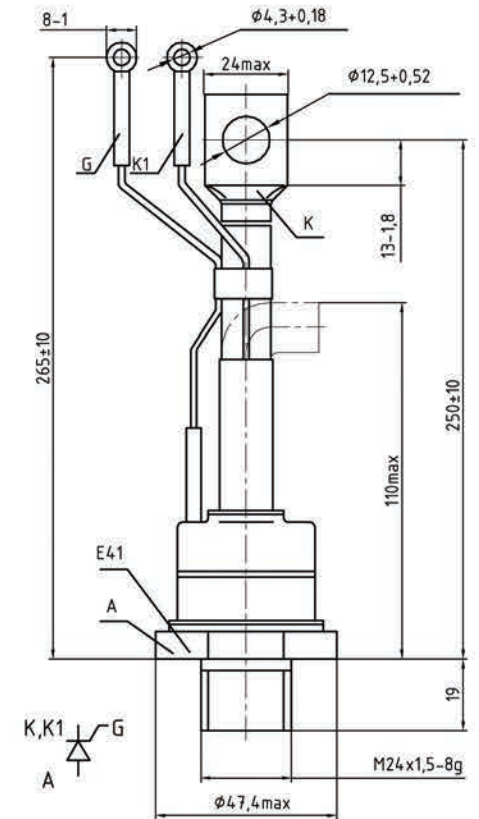


Figure 4  
 Mounting force: 5÷7 kN  
 Weight: 500 g

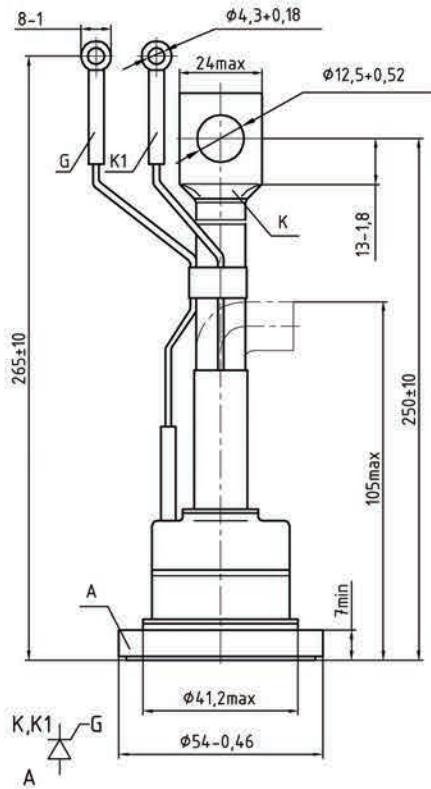


Figure 5  
 Tightening torque:  $40 \pm 60$  Nm  
 Weight: 380 g

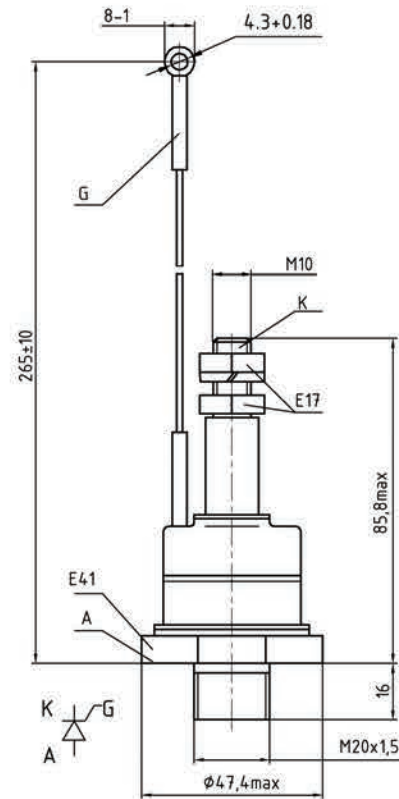


Figure 6  
 Tightening torque:  $25 \pm 35$  Nm  
 Weight: 250 g

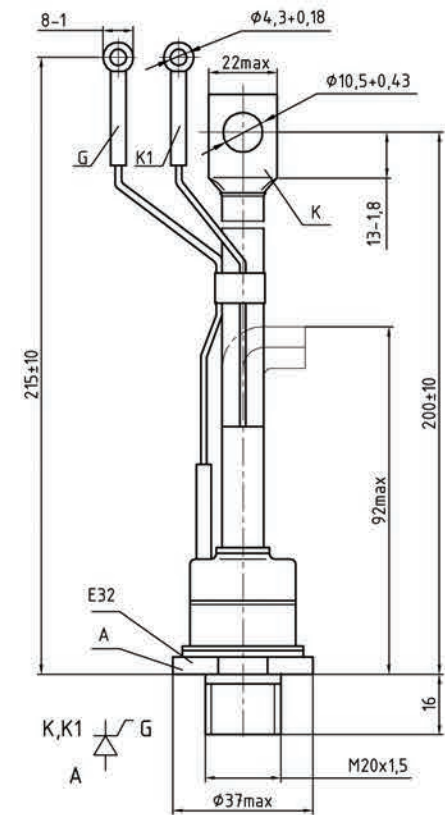


Figure 7

Mounting force:  $9 \div 12$  kN

Weight: 120 g

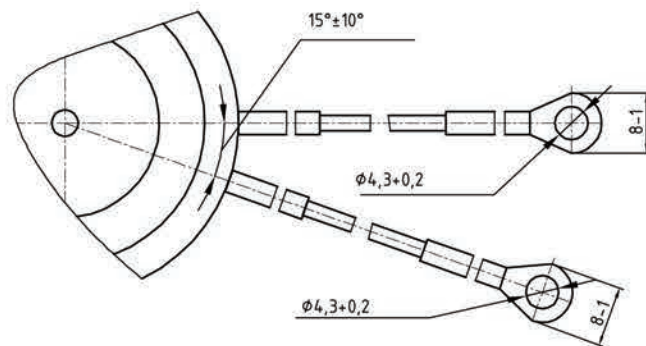
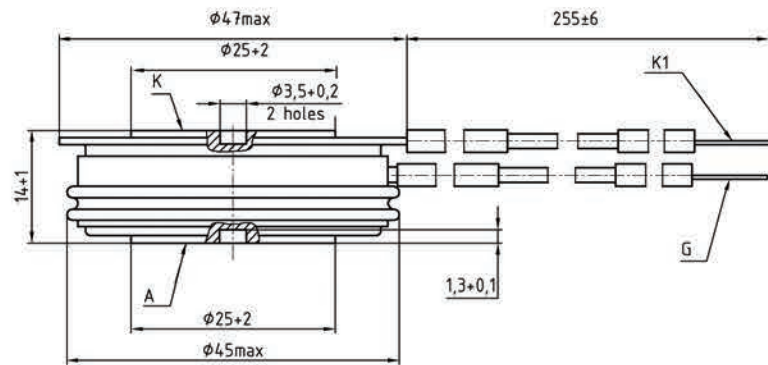


Figure 8

Mounting force:  $13 \div 19$  kN

Weight: 210 g

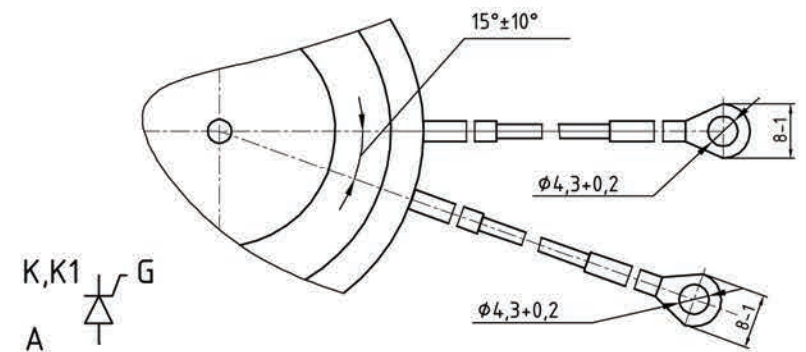
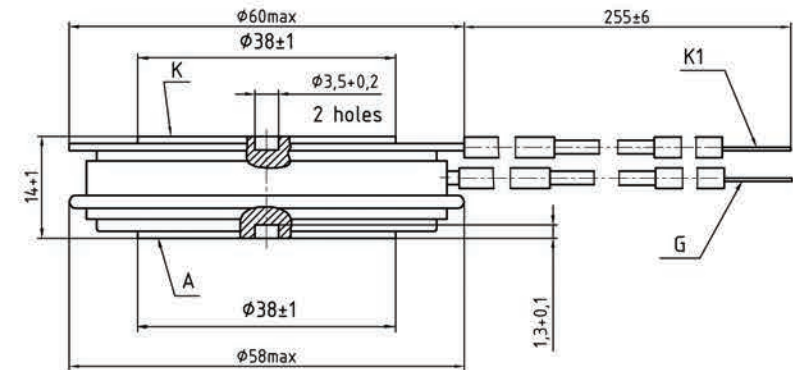


Figure 9

Mounting force:  $19 \pm 28$  kN

Weight: 480 g

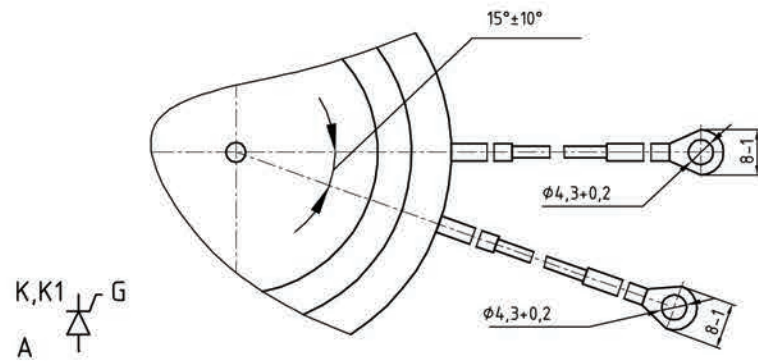
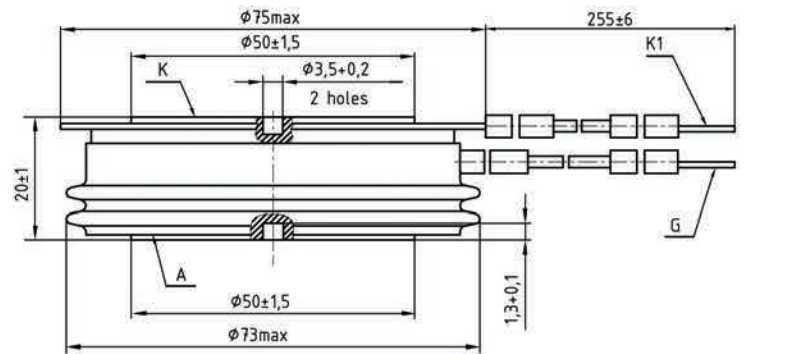


Figure 10

Mounting force:  $19 \pm 28$  kN

Weight: 580 g

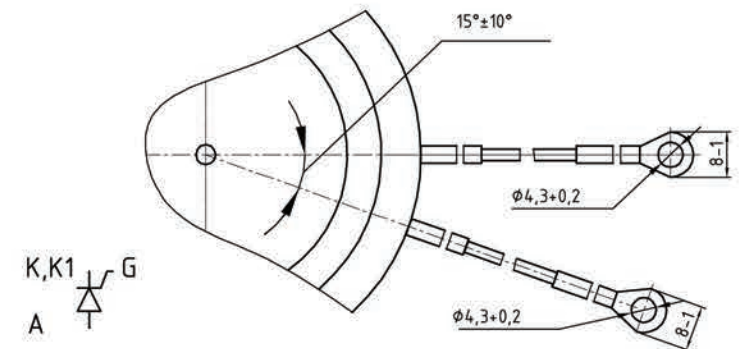
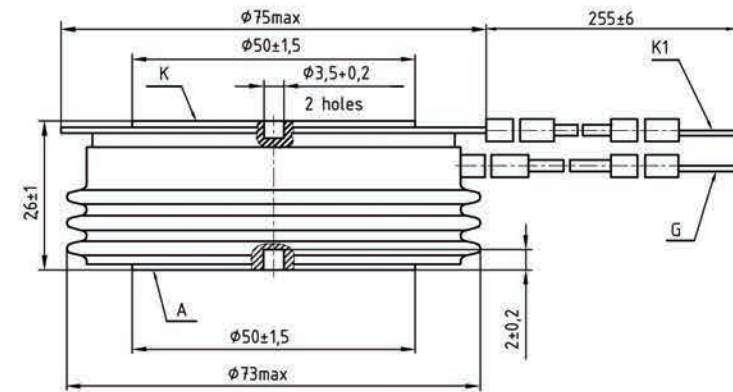


Figure 11  
 Mounting force: 10÷15 kN  
 Weight : 250 g

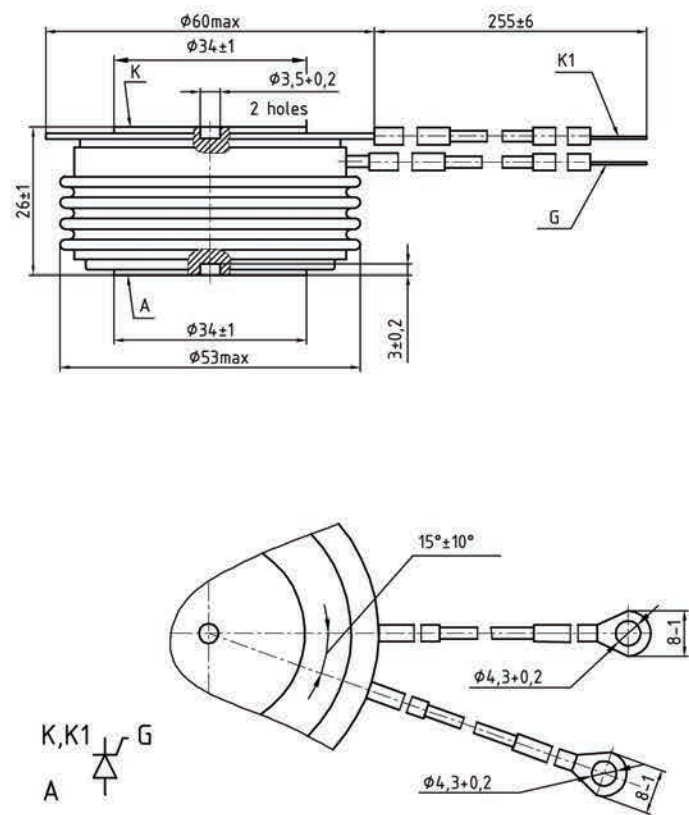


Figure 12  
 Mounting force: 36÷46 kN  
 Weight : 1200 g

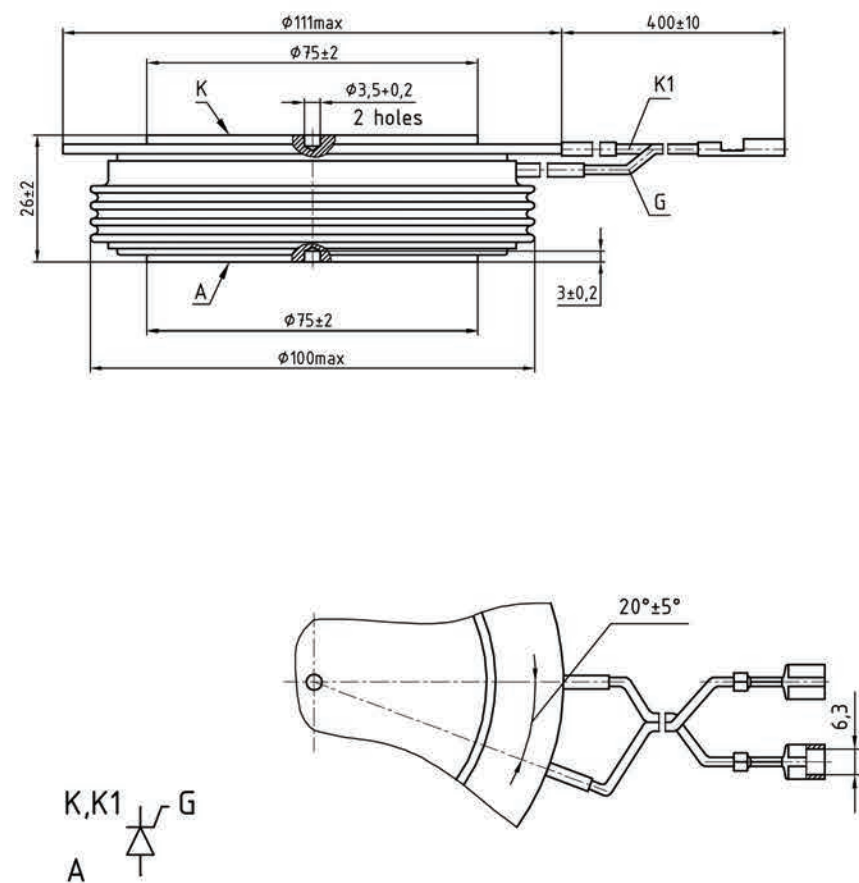


Figure 13  
 Mounting force: 36÷46 kN  
 Weight: 1600 g

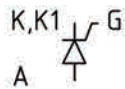
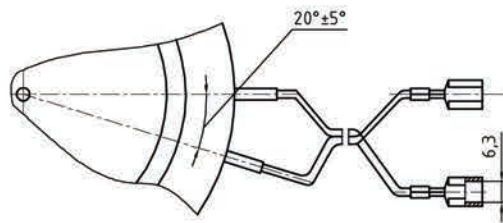
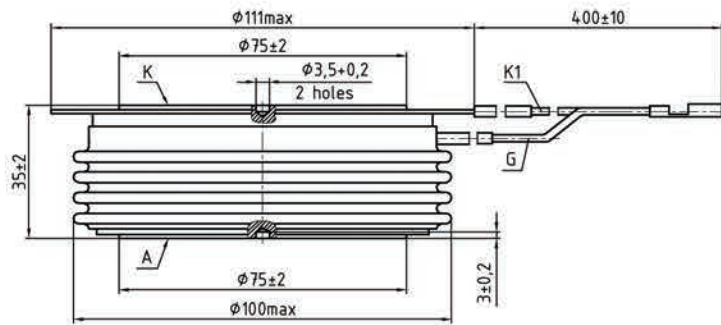


Figure 14  
 Mounting force: 80÷90 kN  
 Weight: 2800 g

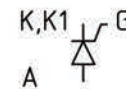
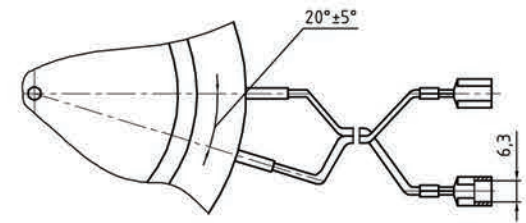
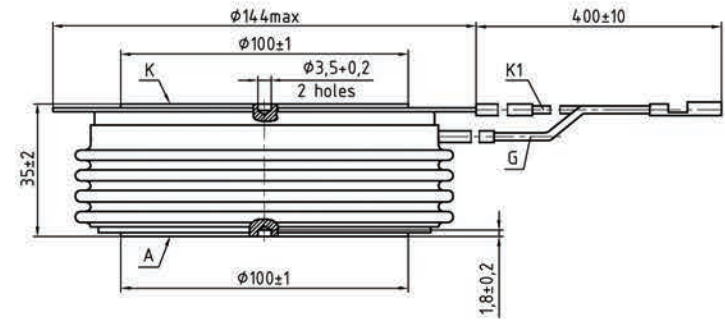




Figure 15  
 Mounting force: 10÷15 kN  
 Weight: 185 g

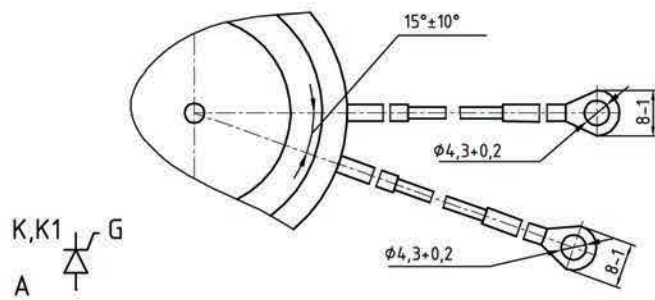
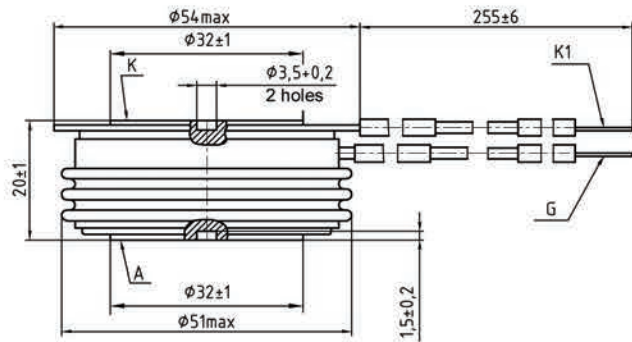


Figure 16  
 Mounting force: 13÷19 kN  
 Weight: 260 g

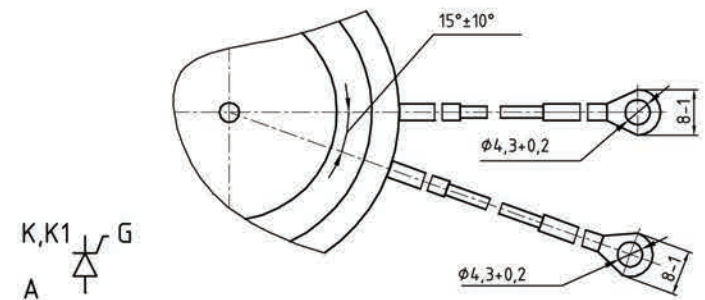
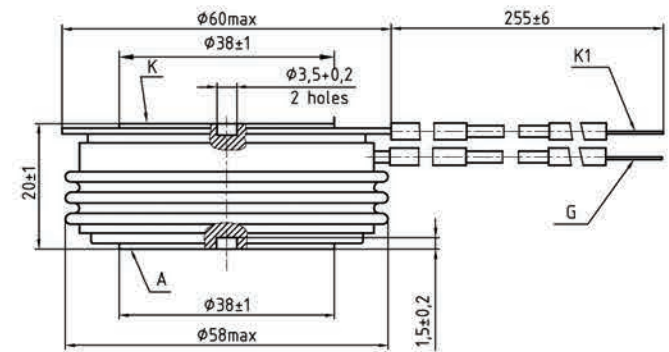


Figure 17  
 Mounting force : 19÷28 kN  
 Weight : 330 g

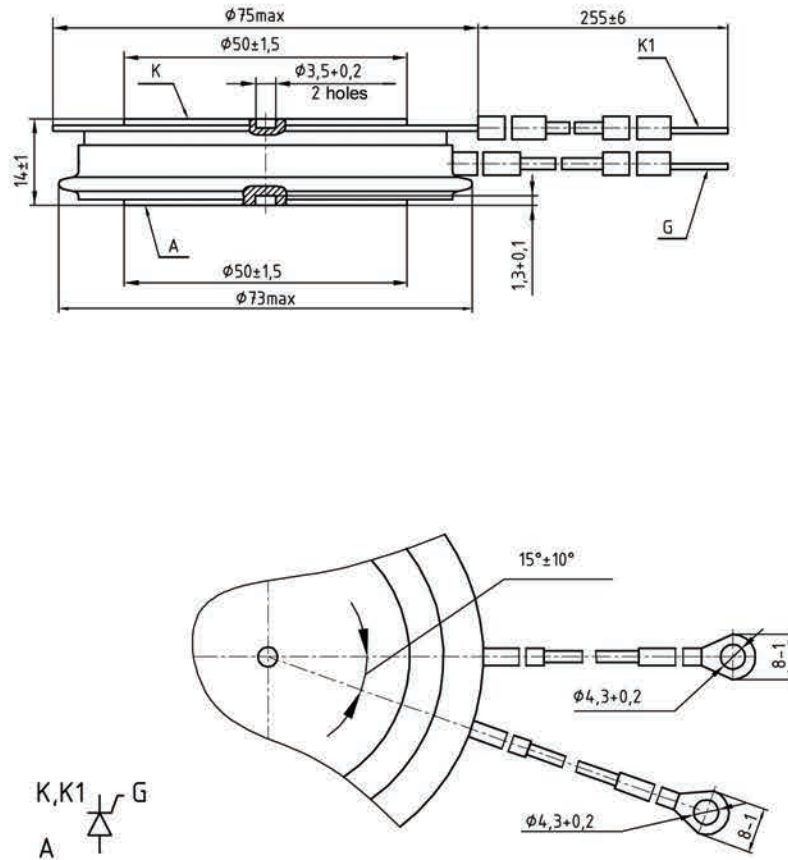
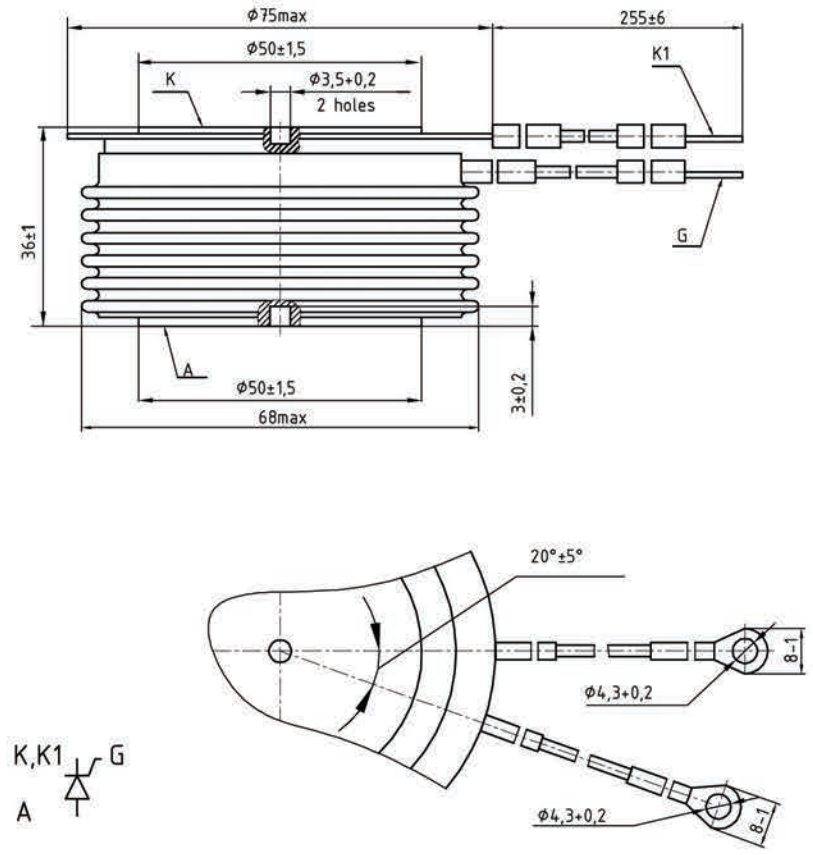


Figure 18  
 Mounting force : 19÷28 kN  
 Weight : 700 g



## Diodes

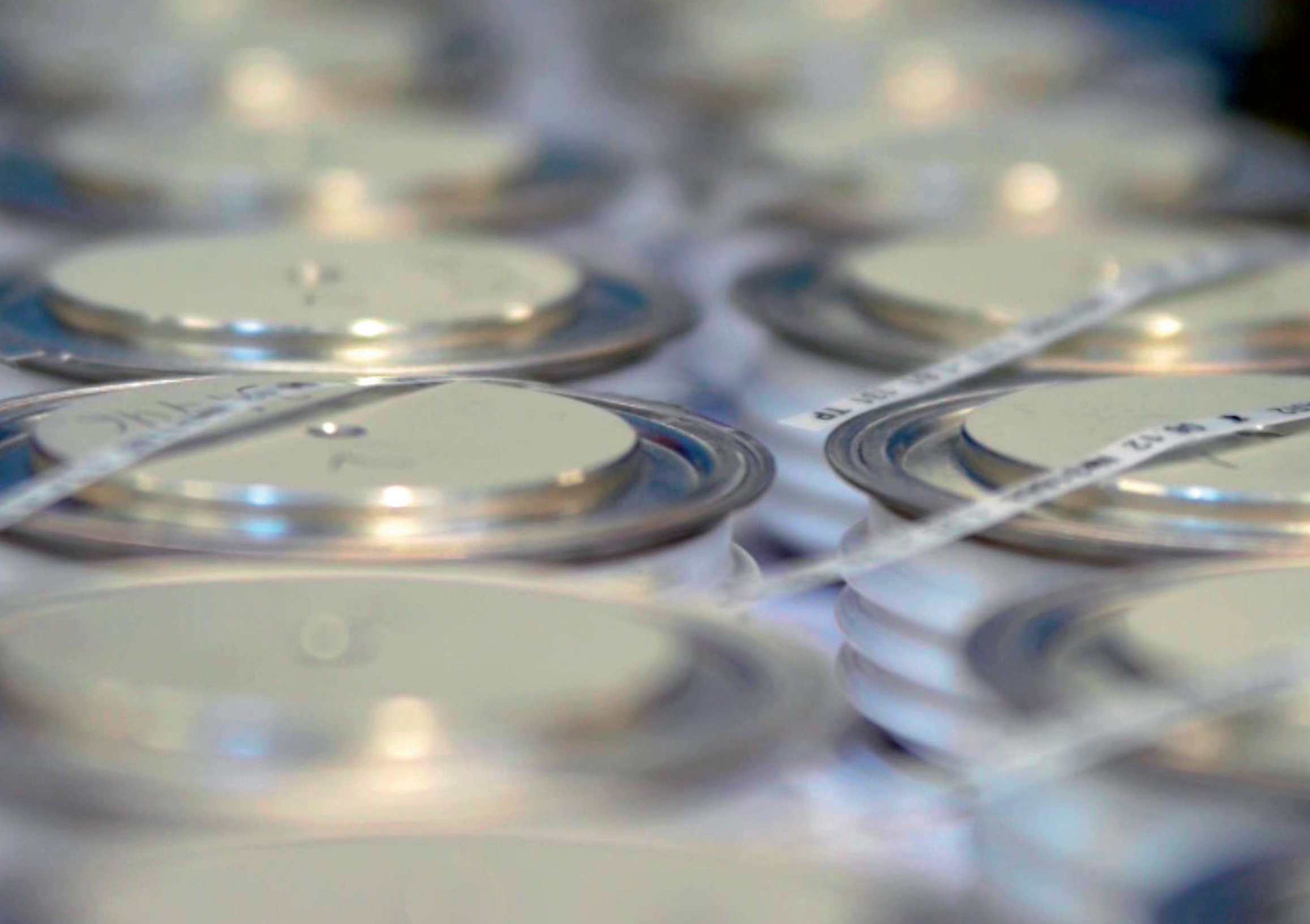
### Key features:

- Compliance with international standards;
- High quality level;
- Particularly high cyclical resistance by means of pressure design;
- Hermetic metal-to-ceramic package.

### Additional features:

- Carrying out selection of devices into groups for parallel, serial, or mixed connection;
- Manufacture of devices on the special requirements of the customer;
- Supply of the devices in assembly with the cooler.





## LETTER SYMBOLS FOR DIODES

$U_{RRM}$	Repetitive peak reverse voltage
$U_{RSM}$	Non-repetitive peak reserve voltage
$I_{FAV}$	Mean forward current
$I_{FRMS}$	RMS forward current
$I_{FSM}$	Surge forward current
$I^2t$	Limiting load integral
$T_{stg}$	Storage temperature
$T_{vj}$	Junction temperature
$T_c$	Case temperature
$M$	Tightening torque
$F$	Mounting force
$U_{FM}$	Peak forward voltage
$U_{T(T0)}$	Threshold voltage
$r_T$	Slope resistance
$I_{RRM}$	Repetitive peak reverse current
$t_{rr}$	Reverse recovery time
$Q_{rr}$	Recovered charge
$R_{thjc}$	Thermal resistance junction to case
$U_{BR}$	Breakdown voltage
$P_{RSM}$	Surge reverse power dissipation

## Group codes of diodes

$t_{rr}$ (fastrecoverydiodes)

Symbol of group	0	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	10	8	6,3	5	4	3,2	2,5	2	1,6	1,25	1	0,8	0,63	0,5	0,4

4600 V			DF433-250			
4400 V				DF443-400	DF453-630 DF453-800	DF473-1600 DF473-2000
3600 V			DF333-320			DF373-2000
3400 V				DF343-630	DF353-800 DF353-1000	
2600 V			DF233-320 DF233-400	DF243-630 DF243-800	DF253-1000 DF253-1250	DF273-2500
2400 V			DF271-320(X) DF271-400(X)			
1800 V		DF361-200(X)		DF143-800 DF143-1000		
1600 V			DF171-400(X) DF133-500			
1400 V	DF251-160(X) DF251-200(X)	DF261-200(X) DF261-250(X) DF261-320(X)				
1200 V					DF153-1250	
600 V					DF053-1600	
$U_{DRM}, U_{RRM} / D$	19 mm	24 mm	30 mm	38 mm	52 mm	80 mm

## Order

1.	2.	3.	4.	5.
DF	153	1250	12	3

1. Fast recovery diode
2. Design version
3. Mean forward current, A
4. Voltage code (12=1200V)
5. Group of reverse recovery time (A4≤10 μs, B4≤8 μs, C4≤6,3 μs, 1≤5 μs, 2≤4 μs, 3≤3,2 μs, 4≤2,5 μs)

# FAST RECOVERY DIODES

Type	URRM V	IFAV (Tc, °C) A	IFSM (10ms) kA	UFM/IFM (25°C) V/A	UF(TO) V	Rt mΩ	trr (-50A/μs) μs	Rthjc °C/W	Tjmax °C	Fig.
DF251-160(X)	600 ÷ 1400	160(103)	3,5	2,4/502	1,40	1,56	2,5; 3,2; 4,0	0,21	170	1
DF251-200(X)	600 ÷ 1400	200(103)	4,3	1,8/628	1,05	1,1	3,2; 4,0	0,21	170	1
DF261-200(X)	600 ÷ 1400	200(84)	4,8	2,1/628	1,10	1,2	2,0; 2,5; 3,2	0,12	125	2
DF261-250(X)	600 ÷ 1400	250(103)	4,5	2,65/785	1,20	1,6	3,2; 4,0; 5,0	0,12	170	2
DF261-320(X)	600 ÷ 1400	320(103)	5,3	2,05/1005	0,80	1,2	3,2; 4,0; 5,0	0,12	170	2
DF361-200(X)	1000 ÷ 1800	200(82)	4,8	2,0/628	1,25	1,1	2,5; 3,2; 4,0	0,12	125	2
DF171-400(X)	800 ÷ 1600	400(80)	9,0	1,9/1256	1,10	0,5	2,0; 2,5; 3,2	0,07	125	3
DF271-320(X)	1400 ÷ 2400	320(80)	7,0	2,4/1005	1,30	0,88	2,5; 3,2; 4,0	0,07	125	3
DF271-400(X)	1400 ÷ 2400	400(70)	8,0	2,3/1256	1,20	0,78	3,2; 4,0; 5,0	0,07	125	3
DF133-500	800 ÷ 1600	500(90)	12,0	2,0/1570	1,15	0,47	2,0; 2,5; 3,2	0,04	125	5
DF233-320	1400 ÷ 2600	320(95)	8,0	2,5/1005	1,40	0,9	2,5; 3,2; 4,0	0,043	125	5
DF233-400	1400 ÷ 2600	400(90)	8,3	2,4/1256	1,30	0,88	2,5; 3,2; 4,0	0,04	125	5
DF333-320	2400 ÷ 3600	320(95)	7,0	2,4/1005	1,55	0,9	2,5; 3,2; 4,0	0,04	125	6
DF433-250	3200 ÷ 4600	250(100)	6,0	2,5/785	1,35	1,55	4,0; 5,0; 6,3	0,04	125	6
DF143-800	800 ÷ 1800	800(80)	14,0	2,3/2512	1,20	0,34	2,5; 3,2; 4,0	0,03	125	7
DF143-1000	800 ÷ 1800	1000(77)	15,0	2,2/3140	1,15	0,25	3,2; 4,0; 5,0	0,027	125	7
DF243-630	1400 ÷ 2600	630(80)	12,0	2,4/1978	1,50	0,55	2,0; 2,5; 3,2	0,03	125	7
DF243-800	1400 ÷ 2600	800(74)	14,0	2,4/2512	1,40	0,48	3,2; 4,0; 5,0	0,027	125	7
DF343-630	2400 ÷ 3400	630(82)	13,0	2,3/1978	1,40	0,56	4,0; 5,0; 6,3	0,03	125	7
DF443-400	3200 ÷ 4400	400(85)	7,0	3,6/1256	1,50	1,8	4,0; 5,0; 6,3	0,03	125	7
DF053-1600	200 ÷ 600	1600(86)	30,0	1,4/5024	0,89	0,08	2,0; 2,5; 3,2	0,02	125	8
DF153-1250	600 ÷ 1200	1250(87)	27,0	1,6/3925	1,10	0,13	2,5; 3,2; 4,0	0,02	125	8
DF253-1000	1400 ÷ 2600	1000(82)	21,0	2,2/3140	1,40	0,29	3,2; 4,0; 5,0	0,02	125	8
DF253-1250	1400 ÷ 2600	1250(73)	22,0	2,3/3925	1,40	0,25	4,0; 5,0; 6,3	0,019	125	8
DF353-800	2400 ÷ 3400	800(90)	19,0	2,5/2512	1,35	0,41	3,2; 4,0; 5,0	0,02	125	8
DF353-1000	2400 ÷ 3400	1000(80)	21,0	2,3/3140	1,35	0,33	4,0; 5,0; 6,3	0,02	125	8
DF453-630	3200 ÷ 4400	630(90)	14,0	3,0/1978	1,40	0,8	5,0; 6,3; 8,0	0,02	125	8
DF453-800	3200 ÷ 4400	800(80)	16,0	2,9/2512	1,40	0,7	6,3; 8,0; 10	0,02	125	8
DF273-2500	1400 ÷ 2600	2500(80)	45,0	1,8/7850	1,25	0,08	6,3; 8,0; 10	0,01	125	9
DF373-2000	2400 ÷ 3600	2000(88)	40,0	1,8/6280	1,20	0,13	10; 12,5; 16	0,01	125	9
DF473-1600	3200 ÷ 4400	1600(86)	36,0	2,3/5024	1,60	0,2	6,3; 8,0; 10	0,01	125	9
DF473-2000	3200 ÷ 4400	2000(76)	40,0	2,4/6280	1,60	0,17	8,0; 10; 12,5	0,01	125	9

6000 V					D553-630 D553-800	
4800 V						D473-2500
4400 V				D443-800	D453-800	
3600 V				D343-1000		D373-3200
3400 V					D353-1250 D353-1600	
3200 V			D333-500			
2800 V				D243-800 D243-1000		
2600 V			D233-500 D233-630 D371-500(X)			D273-4000
2400 V					D253-1600	
2000 V			D133-800			
1800 V		D161-200(X) D161-250(X) D161-320(X)	D271-400(X) D271-500(X)	D143-1000 D143-1250	D153-1600 D153-2000	
1600 V	D151-160(X)					
800 V				D043-2000		
$U_{DRM}, U_{RRM} / D$	19 mm	24 mm	30 mm	38 mm	52 mm	80 mm

**Order**

1.	2.	3.	4.
D	243	1000	24

- 1. Rectifier diode
- 2. Design version
- 3. Mean forward current, A
- 4. Voltage code (24=2400V)



Type	URRM	IFAV (Tc, °C)	IFSM (10ms)	UFM/IFM (25°C)	UF(TO)	RT	trr (typ)	Rthjc	Tjmax	Fig.
	V	A	kA	V/A	V	mΩ	μs	°C/W	°C	
D151-160(X)	1000 ÷ 1600	160(134)	4,5	1,35/502	0,85	0,95	20	0,21	175	1
D161-200(X)	1000 ÷ 1800	200(148)	5,5	1,35/628	0,72	0,78	20	0,12	175	4
D161-250(X)	1000 ÷ 1800	250(140)	6,4	1,35/785	0,72	0,56	22	0,12	175	4
D161-320(X)	1000 ÷ 1800	320(128)	7,5	1,45/1005	0,80	0,53	22	0,12	175	4
D271-400(X)	1000 ÷ 1800	400(130)	12,0	1,45/1256	0,85	0,50	22	0,08	175	3
D271-500(X)	1000 ÷ 1800	500(120)	13,0	1,5/1570	0,85	0,40	25	0,08	175	3
D371-500(X)	1600 ÷ 2600	500(115)	10,0	1,7/1570	0,85	0,45	30	0,085	175	3
D133-800	1000 ÷ 2000	800(128)	13,0	1,65/2512	0,85	0,30	26	0,04	175	5; 10
D233-500	1200 ÷ 2600	500(145)	11,0	1,7/1570	0,85	0,45	25	0,04	175	5; 10
D233-630	1200 ÷ 2600	630(135)	12,0	1,6/1978	0,95	0,40	25	0,04	175	10
D333-500	2200 ÷ 3200	500(122)	11,0	1,6/1570	0,90	0,40	35	0,04	150	5; 10
D043-2000	200 ÷ 800	2000(106)	24,0	1,55/6280	0,86	0,10	22	0,027	180	11
D143-1000	800 ÷ 1800	1000(125)	18,0	1,6/3140	0,85	0,31	22	0,03	175	12; 7
D143-1250	800 ÷ 1800	1250(113)	20,0	1,7/3925	0,90	0,26	22	0,029	175	12; 7
D243-800	1600 ÷ 2800	800(136)	16,0	1,6/2512	1,00	0,30	35	0,03	175	12
D243-1000	1600 ÷ 2800	1000(125)	17,0	1,7/3140	1,00	0,27	35	0,03	175	12
D343-1000	2600 ÷ 3600	1000(100)	15,0	1,9/3140	0,90	0,41	40	0,03	160	7
D443-800	3400 ÷ 4400	800(103)	12,5	1,9/2512	0,95	0,49	35	0,03	150	7
D153-1600	800 ÷ 1800	1600(133)	36,0	1,4/5024	0,86	0,11	30	0,02	175	8
D153-2000	800 ÷ 1800	2000(128)	37,0	1,5/6280	0,80	0,10	30	0,018	175	8
D253-1600	1400 ÷ 2400	1600(125)	35,0	1,5/5024	1,05	0,13	30	0,02	175	8
D353-1250	2200 ÷ 3400	1250(123)	26,0	2,0/3925	1,00	0,33	50	0,02	175	8
D353-1600	2200 ÷ 3400	1600(107)	28,0	2,0/5024	0,95	0,29	50	0,02	175	8
D453-800	3400 ÷ 4400	800(123)	18,0	1,85/2512	0,90	0,38	55	0,02	150	8
D553-630	4400 ÷ 6000	630(127)	14,0	1,8/1978	1,10	0,45	60	0,02	150	8
D553-800	4400 ÷ 6000	800(120)	16,0	1,85/2512	1,05	0,41	60	0,02	150	8
D273-4000	1400 ÷ 2600	4000(105)	65,0	2,2/12560	0,80	0,085	40	0,0095	175	13
D373-3200	2400 ÷ 3600	3200(102)	60,0	1,8/10048	1,25	0,08	60	0,0095	160	13
D473-2500	3400 ÷ 4800	2500(103)	42,0	2,0/7850	0,95	0,16	70	0,0095	150	13

3200 V			DL353-1250 DL353-1600
1800 V	DL161-200(X)	DL171-320(X)	
$U_{DRM}, U_{RRM} / D$	24 mm	32 (30) mm	52 mm

## Order

1.	2.	3.	4.
DL	353	1250	30

1. Avalanche diode
2. Design version
3. Mean forward current, A
4. Voltage code (30=3000V)

## Avalanche Diodes

Type	$U_{RRM}$ V	$I_{FAV} (T_C, ^\circ C)$ A	$I_{FSM} (10ms)$ kA	$U_{FM}/I_{FM} (25^\circ C)$ V/A	$U_{F(TO)}$ V	$R_T$ m $\Omega$	$t_{rr} (typ)$ $\mu s$	$P_{RSM} (100\mu s)$ kW	$R_{thjc}$ °C/W	$T_{jmax}$ °C	Fig.
DL161-200(X)	1000 ÷ 1800	200(116)	6,4	1,4/628	1,00	0,70	25	16,0	0,12	150	4
DL171-320(X)	1000 ÷ 1800	320(116)	10,0	1,4/1005	1,00	0,50	25	16,0	0,075	150	3
DL353-1250	2200 ÷ 3200	1250(123)	26,0	2,0/3925	1,00	0,33	50	16,0	0,02	175	8
DL353-1600	2200 ÷ 3200	1600(107)	28,0	2,0/5024	0,95	0,29	50	16,0	0,02	175	8

3000 ÷ 3800 V	DAS443-400
2000 ÷ 2600 V	DAS343-400
1000 ÷ 1300 V	DAS233-400
$U_{BR}$ / $\varnothing$	30 mm

## Order

1.	2.	3.	4.
DAS	443	400	34

1. Symmetrical surge voltage suppressor
2. Design version, kW
3. Surge power dissipation
4. Voltage class (34=3400 ÷ 3550V)

## Surge Voltage Suppressors

Type	$U_{BR}$ (25 mA, 25°C) V	$P_{RSM}$ (10µs, 25°C) kW	$I_{RRM}$ (0,8 $U_{BR}$ , 25°C) Ma	Temp. coeff. of the avalanche voltage %/°C	$r_T$ (10÷150 A, 25°C) Ω	Asymmetrical avalanche voltage (25°C) %	F kN	$R_{thjc}$ °C / W	$T_{jmax}$ °C	Fig.
DAS233-400	1000 ÷ 1300	400,0	3	0,15	1,7	7	8÷10	0,04	140	5
DAS343-400	2000 ÷ 2600	400,0	4	0,15	1,7	7	8÷10	0,05	140	12
DAS443-400	3000 ÷ 3800	400,0	5	0,15	1,7	7	8÷10	0,06	140	7

Figure 1

Tightening torque :  $12 \div 18$  Nm

Weight : 150 g

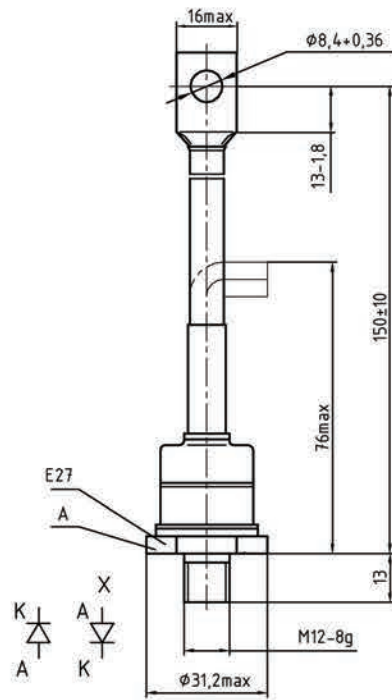


Figure 2

Tightening torque :  $24 \div 36$  Nm

Weight : 260 g

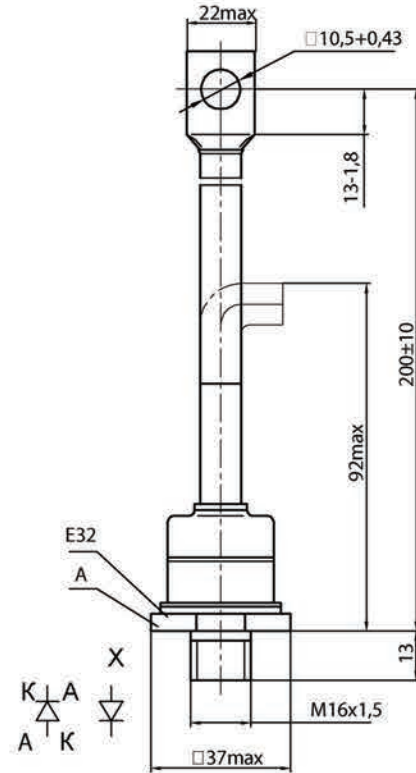


Figure 3

Tightening torque :  $40 \div 60$  Nm

Weight : 480 g

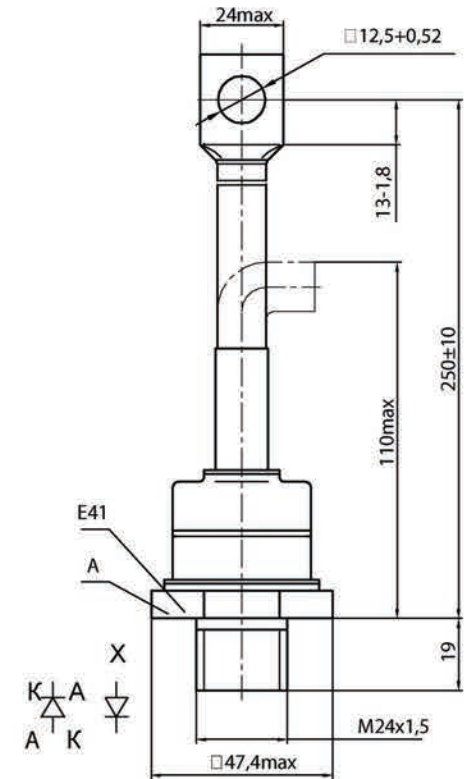


Figure 4  
 Tightening torque : 24÷36 Nm  
 Weight : 280 g

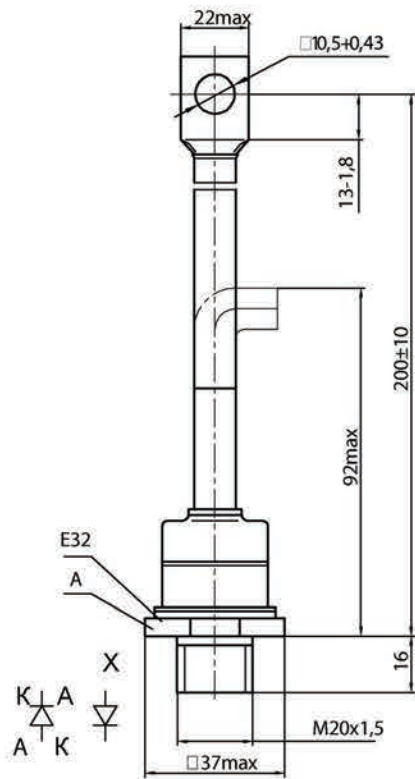


Figure 5  
 Mounting force : 8÷12 kN  
 Weight : 120 g

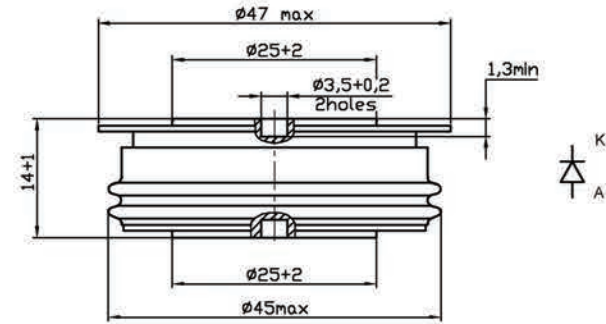


Figure 6  
 Mounting force : 10÷15 kN  
 Weight : 250 g

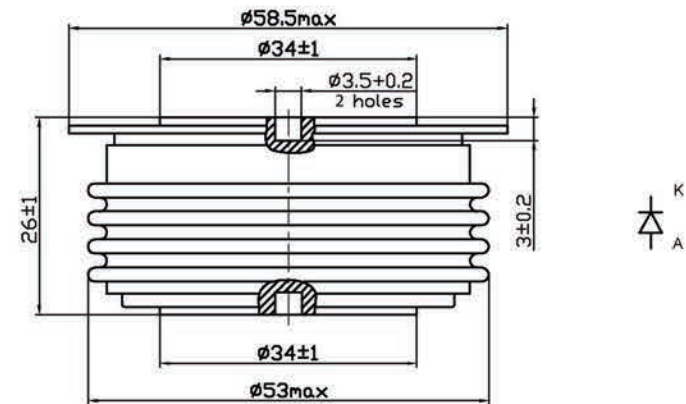


Figure 7

Mounting force :  $13 \div 19$  kN

Weight : 320 g

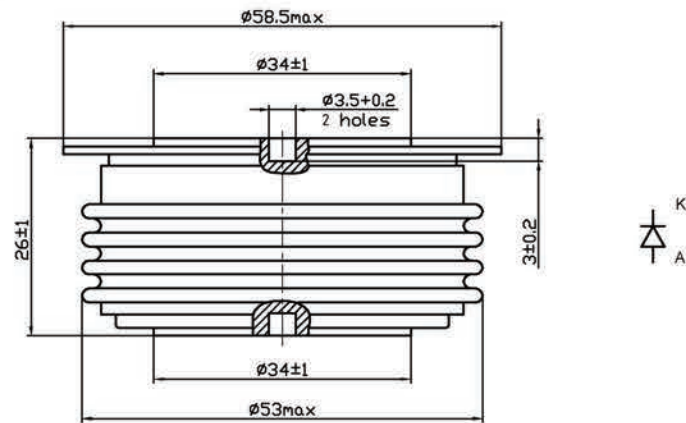


Figure 8

Mounting force :  $19 \div 28$  kN

Weight : 580 g

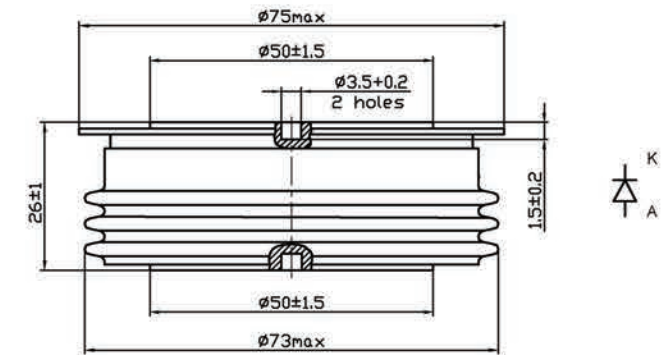


Figure 9

Mounting force :  $36 \div 46$  kN

Weight : 1700 g

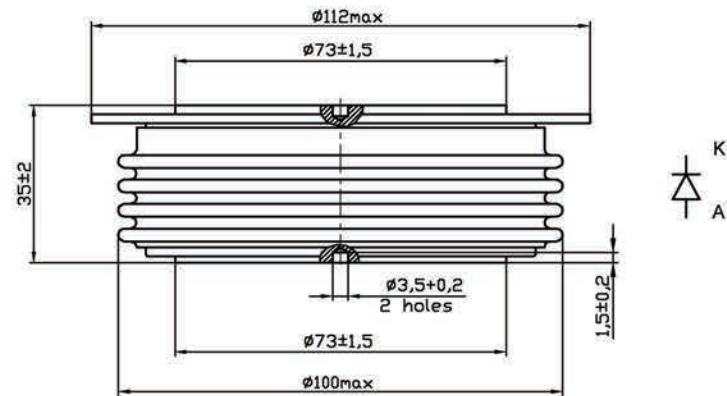


Figure 10

Mounting force :  $10 \div 15$  kN

Weight : 185 g

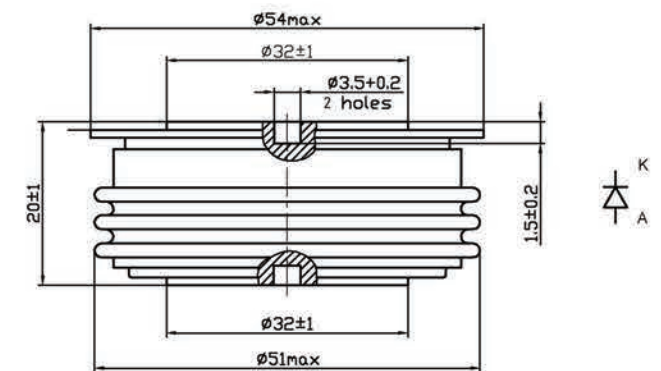


Figure 11  
 Mounting force: 13÷19 kN  
 Weight: 210 g

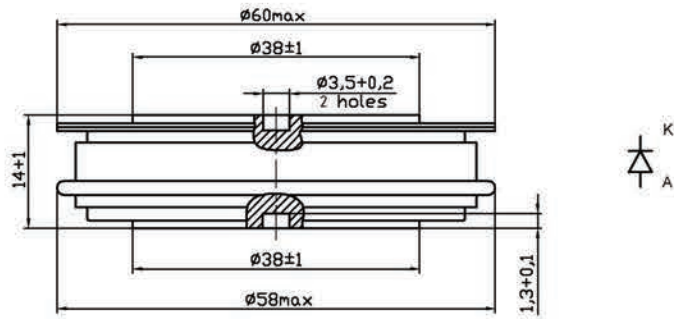


Figure 12  
 Mounting force: 13÷19 kN  
 Weight: 260 g

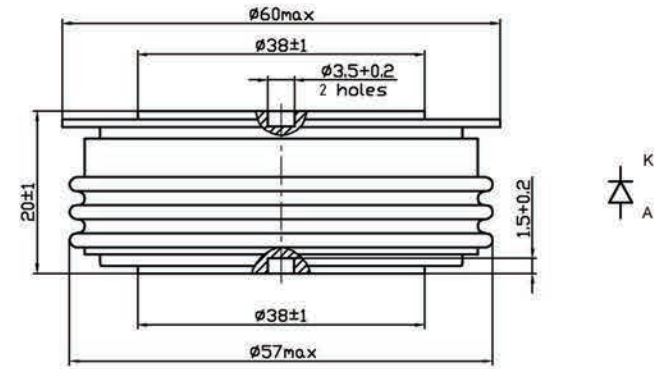
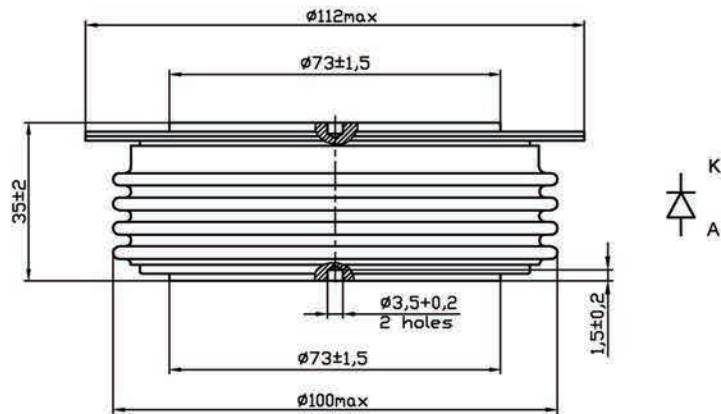
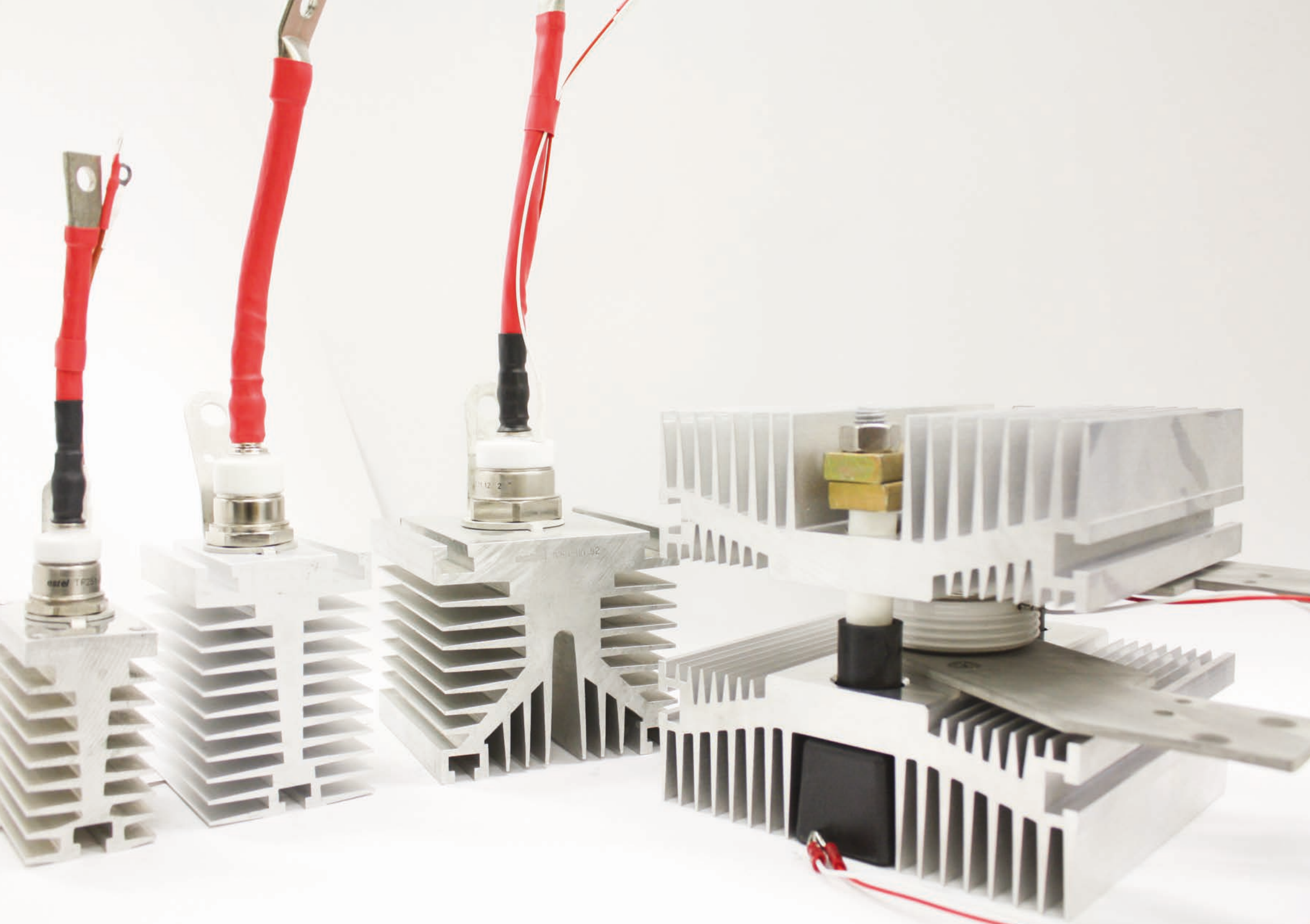


Figure 13  
 Mounting force: 36÷46 kN  
 Weight: 1700 g







## POWER SEMICONDUCTOR DEVICES

### Heatsinks

Diametr of thread hole	Type
M24x1,5, h=22	0281-110
M20x1,5, h=18	0171-80
M16x1,5, h=16	0161-80
M12, h=18	0151-80

**Air-cooled heatsinks for threaded stud designs**

Type	Diametr of thread hole	Diameter of contact surface	Tightening torque	Mass	Thermal resistance, °C/W (dissipation power, W)		Pressure differential Vcf=6m/s	Overall dimensions (without current carryng parts)	Fig.
					Vcf=0m/s	Vcf=6m/s			
	mm	mm	Nm	kg	°C/W	°C/W	Pa	mm	
0151-80	M12, h=18	32 ± 2	20	0,42	1,90 (50)	0,670	15	45x80x131 (45x80x80)	1
0161-80	M16x1,5, h=16	38 ± 3	35	0,80	1,12 (80)	0,355	18	70x80x167 (70x80x100)	2
0171-80	M20x1,5, h=18	48 ± 3	50	0,80	1,12 (80)	0,355	18	70x80x167 (70x80x100)	3
0281-110	M24x1,5, h=22	48 ± 3	60	1,75	0,71 (130)	0,236	25	110x110x167 (110x110x100)	4

Diameter of contact surface	Type
55 ± 3	0153-150 0353-150
42 ± 3	0243-150

## Air-cooled heatsinks for threaded stud designs

Type	Diameter of contact surface	Clamping force	Device height min (max)	Mass	Thermal resistance, °C/W (dissipation power, W)		Pressure differential Vcf=6m/s	Insulation test voltage	Overall dimensions (without current carrying parts)	Fig.
					Vcf=0m/s °C/W	Vcf=6m/s °C/W				
	mm	kN	mm	kg			Pa	V	mm	
0243-150	42 ± 3	16,5	13 (23)	5,8	0,28 (220)	0,080	30	5000	230x150x170 (170x150x170)	5
0153-150	55 ± 3	28,0	18 (28)	6,0	0,28 (220)	0,075	30	5000	230x150x176 (170x150x176)	6
0353-150	55 ± 3	28,0	18 (28)	5,7	0,355 (220)	0,100	30	5000	230x150x156 (170x150x156)	7

Diameter of contact surface	Type
50 ± 0,8	TP-024P TP-026P TP-027P

### Water-cooled heatsinks for threaded stud designs

Type	Diameter of contact surface	Clamping force	Mass	Thermal resistance, °C/W (cooling water consumption 5l/min)	Overall dimensions	Fig.
	mm	kN	kg	°C/W	mm	
TP-024P	50 ± 0,8	28,8	0,8	0,035	84,5x175x28,5	8
TP-026P	50 ± 0,8	28,8	0,5	0,035	72x88x28,5	9
TP-027P	50 ± 0,8	28,8	0,8	0,035	84,5x193x28,5	10

Figure 1

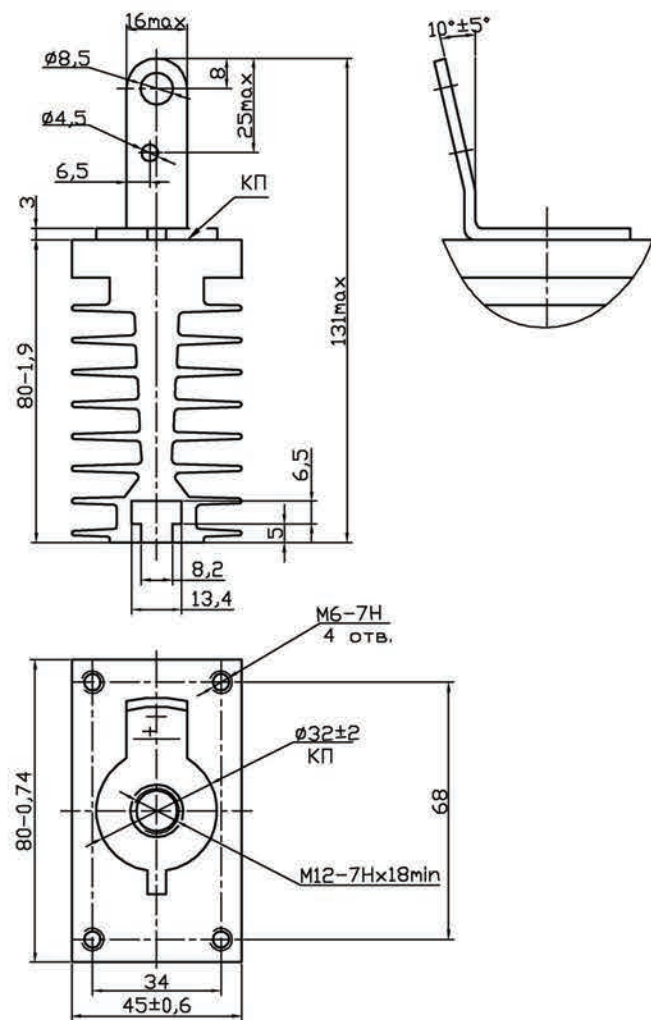


Figure 2

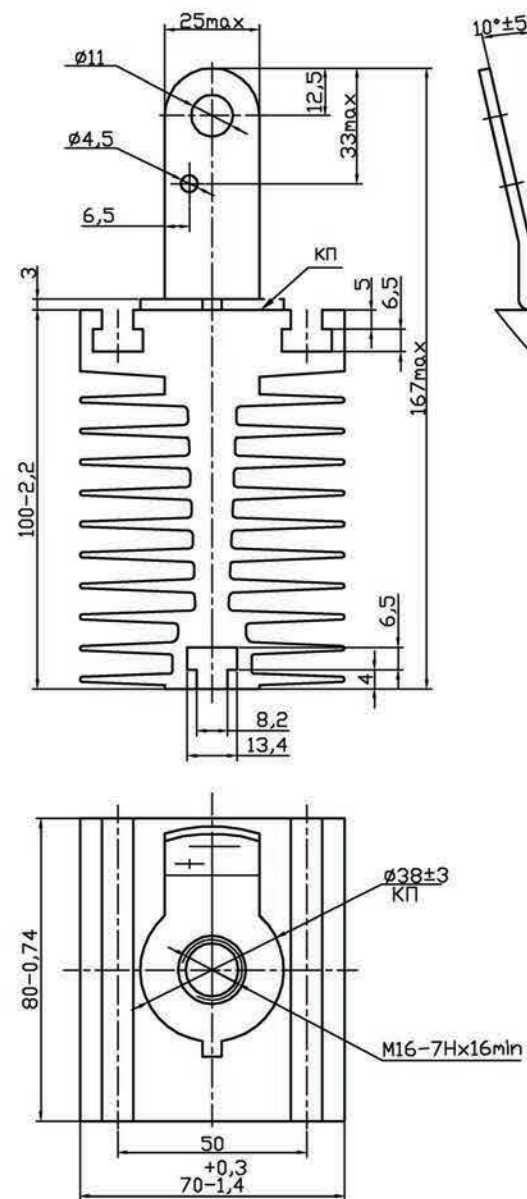


Figure 3

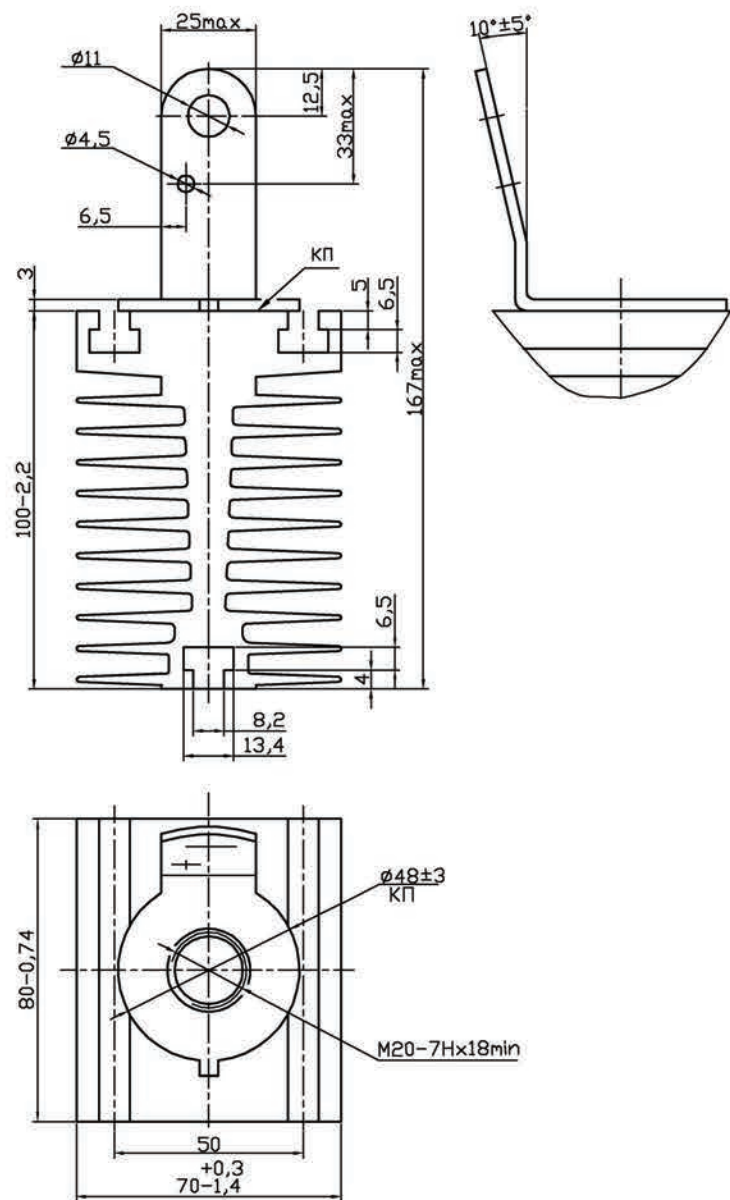


Figure 4

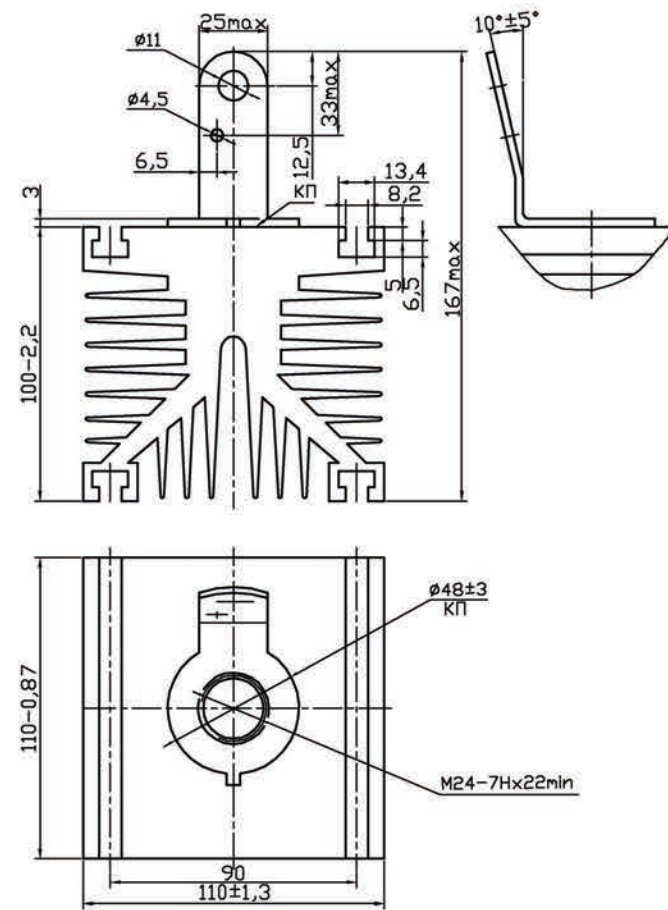




Figure 7

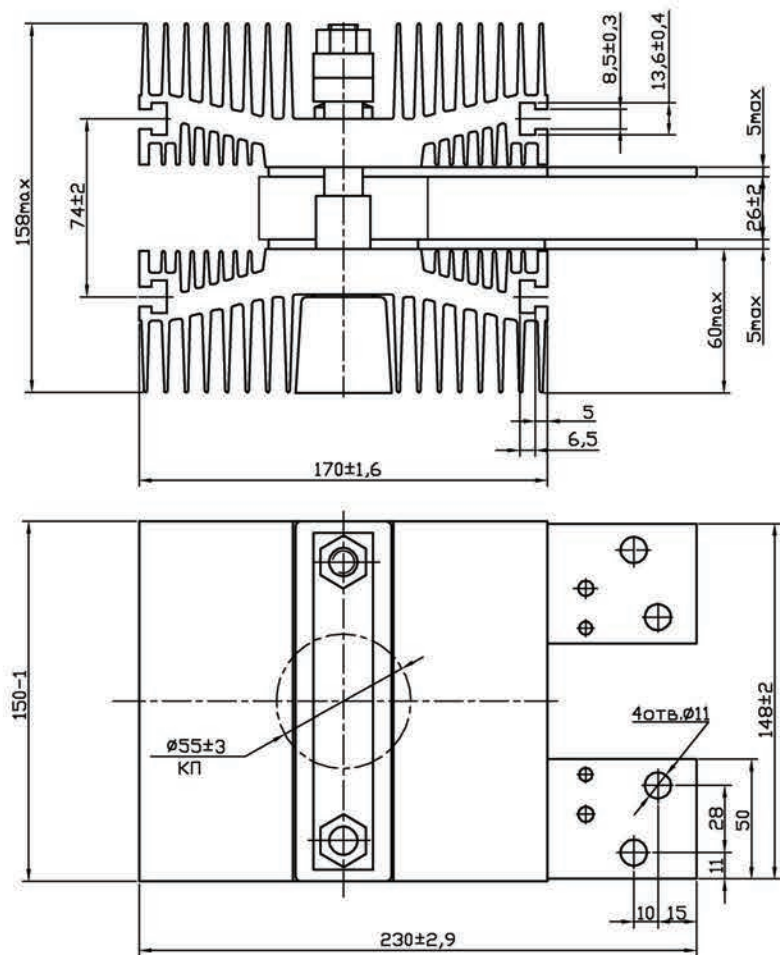


Figure 8

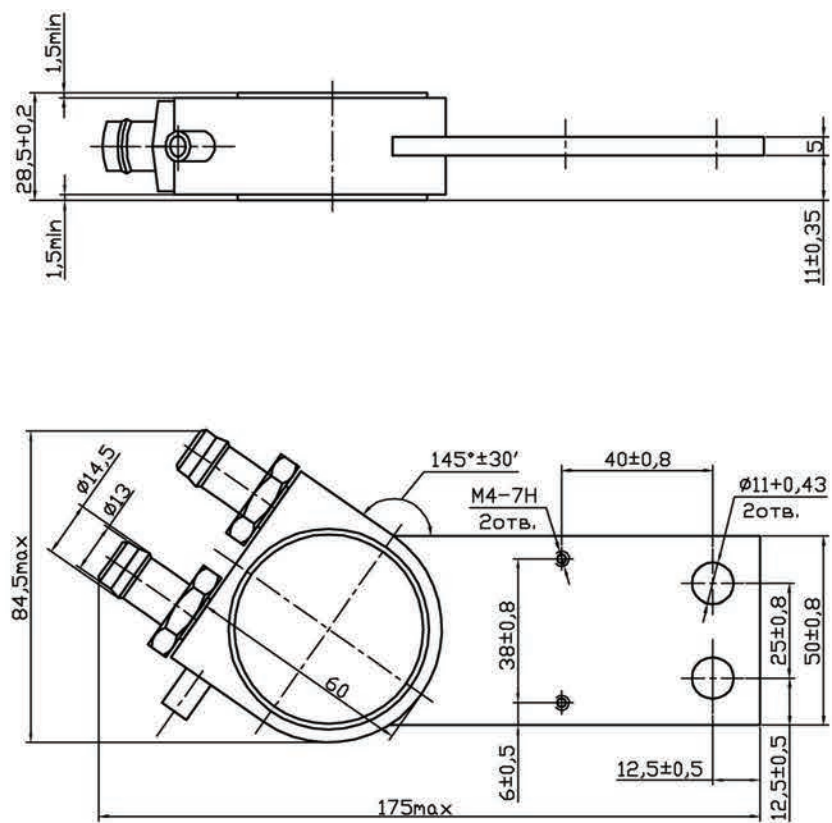




Figure 9

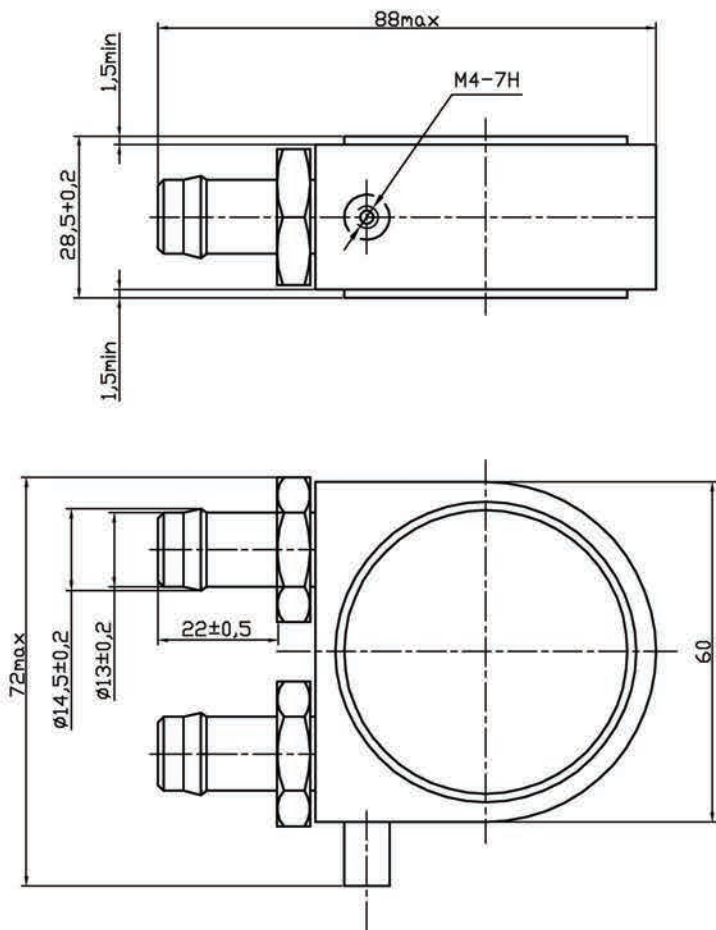
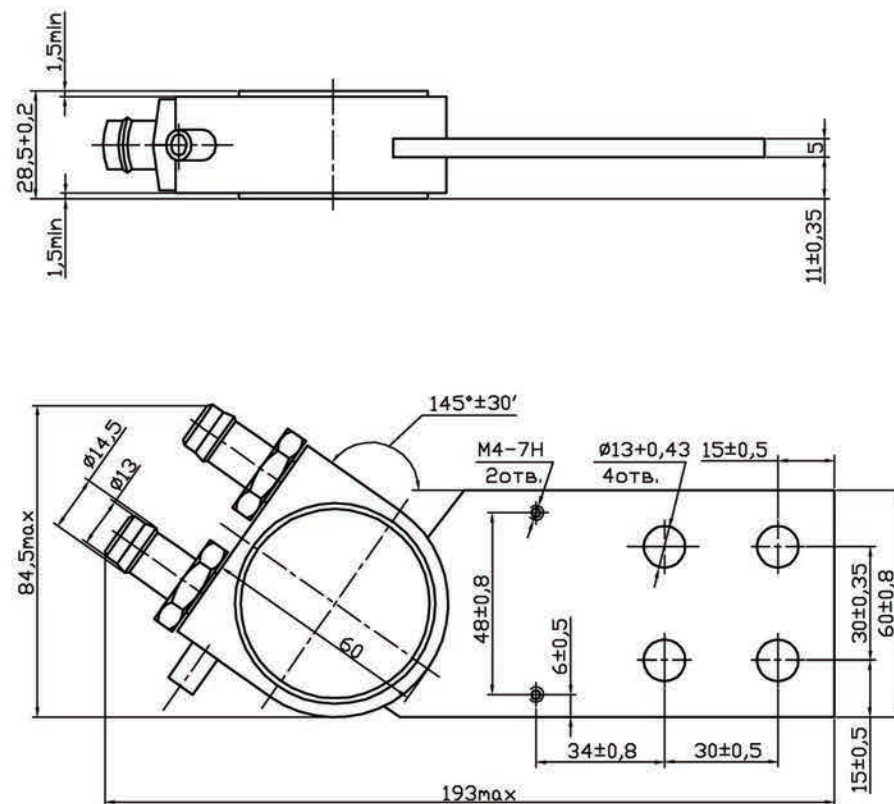


Figure 10



## GEOGRAPHY OF SUPPLIES



Armenia  
Azerbaijan  
Belarus  
Bosnia and Herzegovina  
Bulgaria  
China  
Croatia  
Cuba  
Czech Republic  
Egypt  
England  
Estonia  
Finland  
France  
Georgia  
Germany  
Hungary  
India  
Iran  
Iraq  
Ireland  
Israel  
Italy  
Kazakhstan  
Korea  
Kyrgyzstan  
Latvia  
Lithuania  
Macedonia  
Malaysia  
Moldavia  
Morocco  
Norway  
Oman  
Panama  
Poland  
Romania  
Russia  
Serbia  
Slovakia  
Slovenia  
Spain  
Sweden  
Switzerland  
Tajikistan  
Turkey  
Turkmenistan  
UAE  
Ukraine  
USA  
Uzbekistan  
Vietnam

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