

**Elektrische Eigenschaften**

**Electrical properties**

Höchstzulässige Werte

Maximum permissible values

|                    |   |  |   |                  |
|--------------------|---|--|---|------------------|
| $V_{DRM}, V_{RRM}$ | Periodische Vorwärts- und Rückwärts-Sperrspannung | repetitive peak forward off-state and reverse voltages | 400...1800  | V                |
| $I_{TRMSM}$        | Effektiver Durchlaßstrom                          | RMS on-state current                                   | 700   | A                |
| $I_{TAVM}$         | Dauergrenzstrom                                   | average on-state current                               | $t_C = 85^\circ C$<br>358   | A                |
|                    |   |  | $t_C = 69^\circ C$<br>445   | A                |
| $I_{TRM}$          | Periodischer Spitzenstrom                         | repetitive peak on-state current                       | 4200  | A                |
| $I_{TSM}$          | Stoßstrom-Grenzwert                               | surge current  | $t_p = 10 \text{ ms}, t_{vj} \leq 45^\circ C$<br>5200   | A                |
|                    |   |  | $t_p = 10 \text{ ms}, t_{vj} = t_{vj \text{ max}}$<br>4600  | A                |
| $\int i^2 dt$      | Grenzlastintegral                                 | $\int i^2 dt$ -value                                   | $t_p = 10 \text{ ms}, t_{vj} \leq 45^\circ C$<br>135000   | A <sup>2</sup> s |
|                    |   |  | $t_p = 10 \text{ ms}, t_{vj} = t_{vj \text{ max}}$<br>106000  | A <sup>2</sup> s |
| $(di/dt)_{cr}$     | Kritische Stromsteilheit                          | critical rate of rise of on-state current              | nicht periodisch/non repetitive<br>800  | A/ $\mu$ s       |
|                    |   |  | Dauerbetrieb/continuous operation, $i_{TM} = 1200 \text{ A}$ ,<br>$V_L = 10 \text{ V}, I_G = 1 \text{ A}, di_G/dt = 1 \text{ A}/\mu\text{s}$<br>150 | A/ $\mu$ s       |
| $(dv/dt)_{cr}$     | Kritische Spannungssteilheit                      | critical rate of rise of off-state voltage             | $V_D = 67\% V_{DRM}, t_{vj} = t_{vj \text{ max}}$<br>5. Kennbuchstabe/5th letter C<br>400   | V/ $\mu$ s       |
|                    |   |  | 5. Kennbuchstabe/5th letter F<br>1000   | V/ $\mu$ s       |

Charakteristische Werte

Characteristic values

|            |   |   |  |      |            |
|------------|---|---|--|------|------------|
| $V_T$      | Obere Durchlaßspannung                    | max. on-state voltage                       | $t_{vj} = t_{vj \text{ max}}, I_T = 1200 \text{ A}$                          | 2,07 | V          |
| $V_{(TO)}$ | Schleusenspannung                         | threshold voltage                           | $t_{vj} = t_{vj \text{ max}}$  | 0,85 | V          |
| $r_T$      | Ersatzwiderstand                          | slope resistance                            | $t_{vj} = t_{vj \text{ max}}$  | 0,9  | m $\Omega$ |
| $V_{GT}$   | Obere Zündspannung                        | max. gate trigger voltage                   | $t_{vj} = 25^\circ C, V_D = 6 \text{ V}, R_A = 5 \Omega$                     | 2    | V          |
| $I_{GT}$   | Oberer Zündstrom                          | max. gate trigger current                   | $t_{vj} = 25^\circ C, V_D = 6 \text{ V}, R_A = 5 \Omega$                     | 200  | mA         |
|            | Unterer Zündstrom                         | min. gate trigger current                   | $t_{vj} = t_{vj \text{ max}}, V_D = 6 \text{ V}, R_A = 5 \Omega$             | 10   | mA         |
| $I_H$      | Oberer Haltestrom                         | max. holding current                        | $t_{vj} = 25^\circ C, V_D = 6 \text{ V}, R_A = 5 \Omega$                     | 300  | mA         |
| $I_L$      | Oberer Einraststrom                       | max. latching current                       | $t_{vj} = 25^\circ C, V_D = 6 \text{ V}, R_{GK} \geq 10 \Omega$              | 1,2  | A          |
|            |   |   | $I_G = 1 \text{ A}, di_G/dt = 1 \text{ A}/\mu\text{s}, t_q = 20 \mu\text{s}$ |      |            |
| $I_D, I_R$ | Oberer Vorwärts- und Rückwärts-Sperrstrom | max. forward off-state and reverse currents | $t_{vj} = t_{vj \text{ max}}, V_D = V_{DRM} (V_R = V_{RRM})$                 | 50   | mA         |
| $t_{gd}$   | Oberer Zündverzug                         | max. gate controlled delay time             | $I_G = 1 \text{ A}, di_G/dt = 1 \text{ A}/\mu\text{s}$                       | 3    | $\mu$ s    |
| $t_q$      | Typische Freiwerdezeit                    | typical turn-off time                       | Prüfbedingungen/test conditions 3.4.3.4                                      | 250  | $\mu$ s    |
| $C_{null}$ | Typische Nullkapazität                    | typical zero capacitance                    | $t_{vj} = 25^\circ C, f = 10 \text{ kHz}$                                    | 4    | nF         |

**Thermische Eigenschaften**

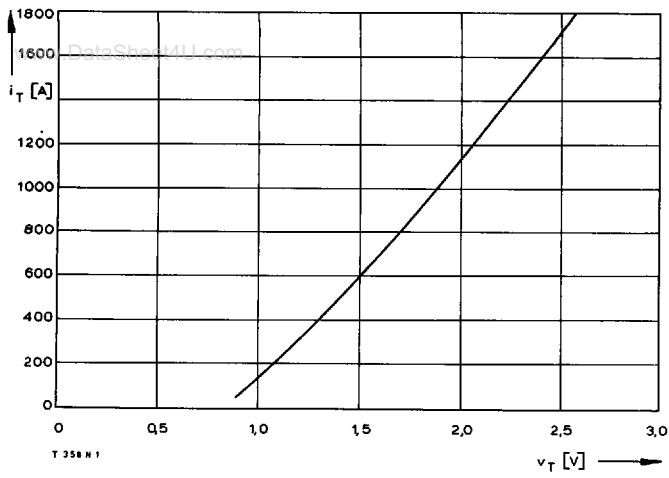
**Thermal properties**

|                      |  |  |   |  |
|----------------------|--|--|---|--|
| $R_{thJC}$           | Innere Wärmewiderstand für beidseitige Kühlung                     | thermal resistance, junction to case for two-sided cooling | $\Theta = 180^\circ \text{el, sinus}$<br>DC | $\leq 0,068^\circ C/W$<br>$\leq 0,065^\circ C/W$ |
| $R_{thJC(A)}$        | für anodenseitige Kühlung  | for anode-sided cooling                                    | $\Theta = 180^\circ \text{el, sinus}$<br>DC | $\leq 0,113^\circ C/W$<br>$\leq 0,11^\circ C/W$  |
| $R_{thJC(K)}$        | für kathodenseitige Kühlung  | for cathode-sided cooling                                  | $\Theta = 180^\circ \text{el, sinus}$<br>DC | $\leq 0,159^\circ C/W$<br>$\leq 0,156^\circ C/W$ |
| $R_{thCK}$           | Wärmewiderstand für einen Übergang zwischen Gehäuse und Kühlkörper | single sided thermal resistance, case to heatsink          |   | 0,03 $^\circ C/W$                                |
| $t_{vj \text{ max}}$ | Höchstzul. Sperrschichttemperatur                                  | max. junction temperature                                  |   | 125 $^\circ C$                                   |
| $t_{vj \text{ op}}$  | Betriebstemperatur   | operating temperature                                      |   | - 40 $^\circ C$ ...+125 $^\circ C$               |
| $t_{stg}$            | Lagertemperatur  | storage temperature  |   | - 40 $^\circ C$ ...+140 $^\circ C$               |

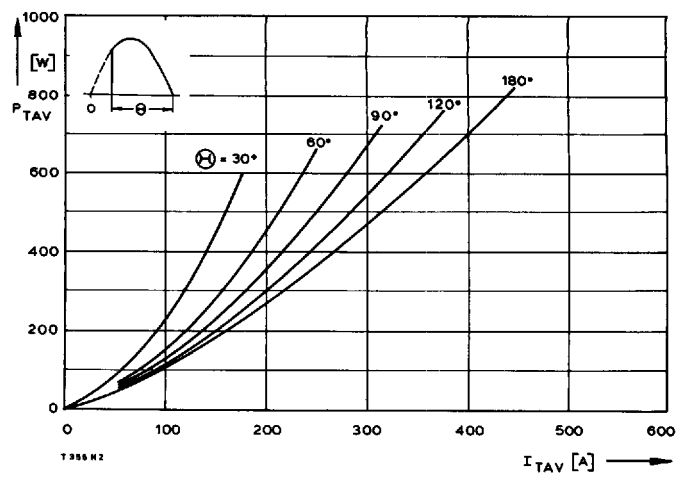
**Mechanische Eigenschaften**

**Mechanical properties**

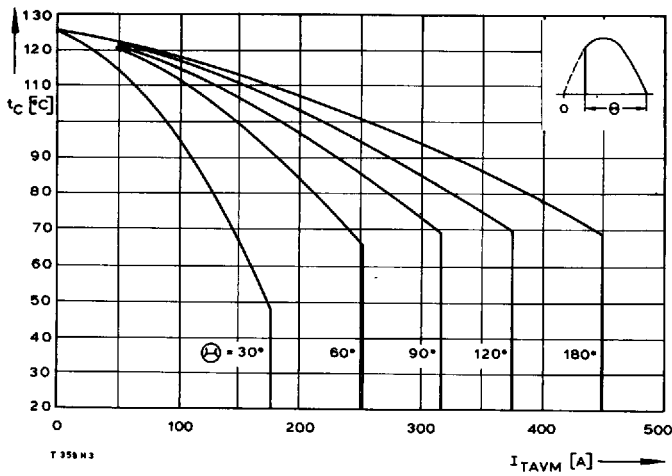
|   |                    |                         |                   |            |        |
|---|--------------------|-------------------------|-------------------|------------|--------|
| G | Gewicht            | weight                  |                   | 70         | g      |
| F | Anpreßkraft        | clamping force          |                   | 4...6      | kN     |
|   | Maßbild            | outline                 | DIN 41814-151 A 4 | Seite/page | 240    |
|   | Kriechstrecke      | creepage distance       |                   |            | 17     |
|   | Feuchtklasse       | humidity classification | DIN 40040         |            | C      |
|   | Schüttelfestigkeit | vibration resistance    | f = 50 Hz         |            | 5x9,81 |



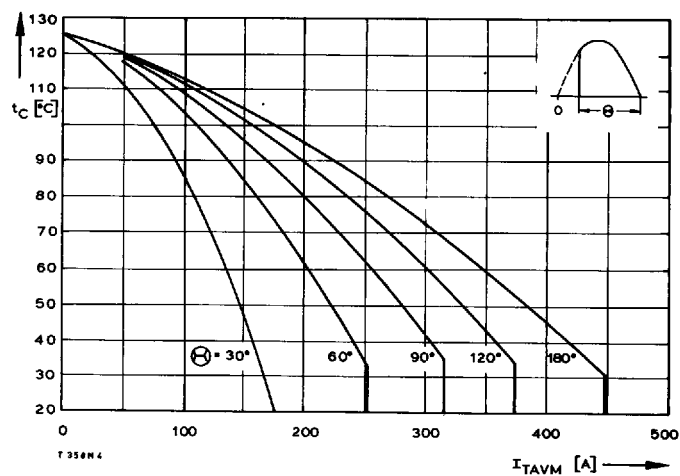
**Bild/Fig. 1**  
Grenzdurchlaßkennlinie bei  $t_{vj \max}$   
Max. on-state characteristic at  $t_{vj \max}$



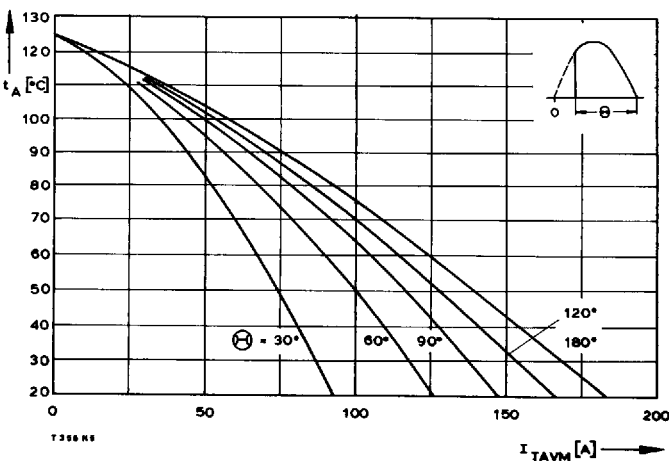
**Bild/Fig. 2**  
Durchlaßverlustleistung  $P_{TAV}$ /On-state power loss  $P_{TAV}$   
Parameter: Stromflußwinkel  $\theta$ /current conduction angle  $\theta$



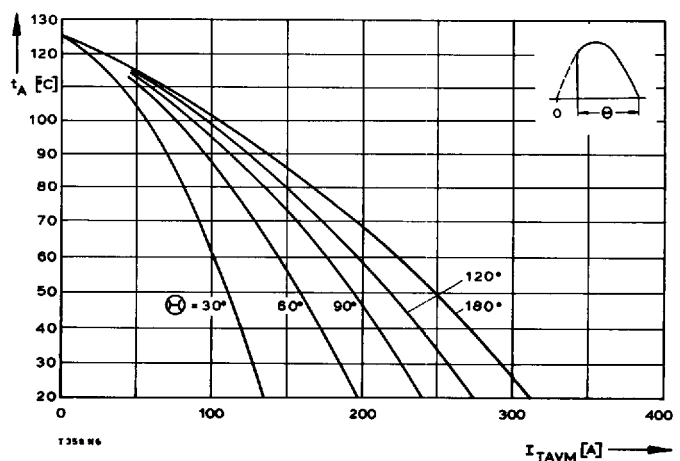
**Bild/Fig. 3**  
Höchstzulässige Gehäusetemperatur  $t_c$  bei beidseitiger Kühlung  
Maximum allowable case temperature  $t_c$  at two-sided cooling



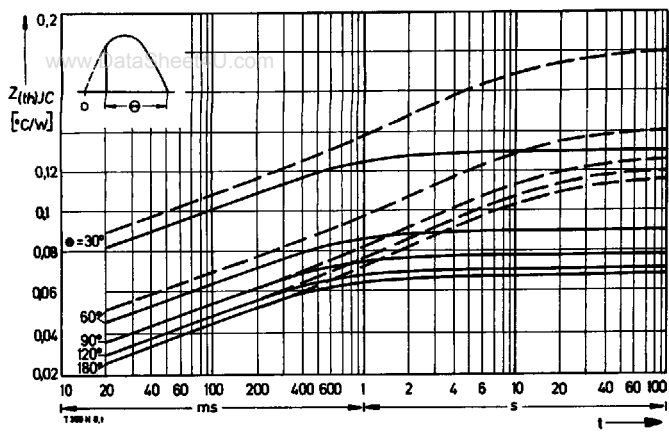
**Bild/Fig. 4**  
Höchstzulässige Gehäusetemperatur  $t_c$  bei anodenseitiger Kühlung  
Maximum allowable case temperature  $t_c$  at anode sided cooling



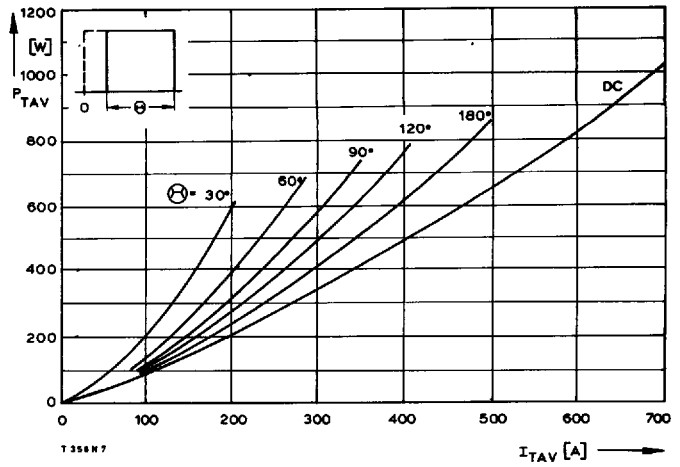
**Bild/Fig. 5**  
Höchstzulässige Kühlmitteltemperatur  $t_A$  bei beidseitiger Luftselbstkühlung,  
Kühlkörper K 0,36 S.  
Maximum allowable cooling medium temperature  $t_A$  at natural two-sided cooling,  
heatsink type K 0.36 S.



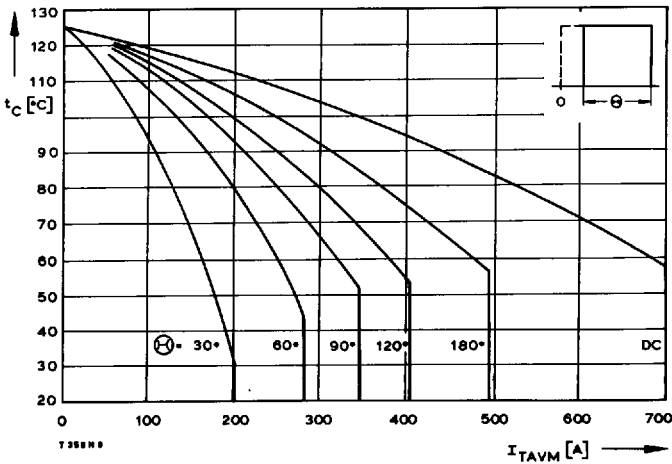
**Bild/Fig. 6**  
Höchstzulässige Kühlmitteltemperatur  $t_A$  bei verstärkter beidseitiger Luftkühlung,  
Kühlkörper K 0,12 F,  $V_L = 50$  l/s.  
Maximum allowable cooling medium temperature  $t_A$  at forced two-sided cooling,  
heatsink type K 0.12 F,  $V_L = 50$  l/s.



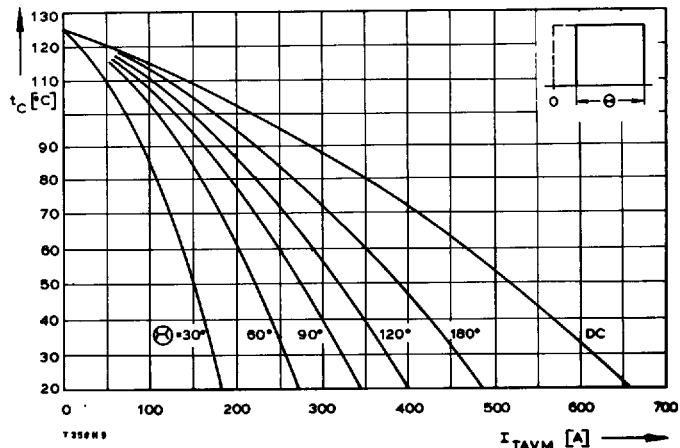
Bild/Fig. 7  
 Transient inner thermal impedance  $Z_{th(jc)}$   
 Transient thermal impedance, junction case,  $Z_{th(jc)}$   
 - - - anodenseitige Kühlung/anode sided cooling  
 — beidseitige Kühlung/two-sided cooling



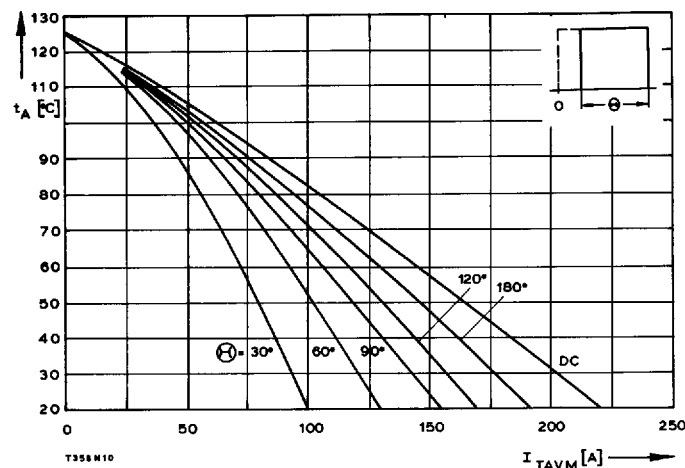
Bild/Fig. 8  
 Durchlaßverlustleistung  $P_{TAV}$ /On-state power loss  $P_{TAV}$   
 Parameter: Stromflußwinkel  $\theta$ /current conduction angle  $\theta$



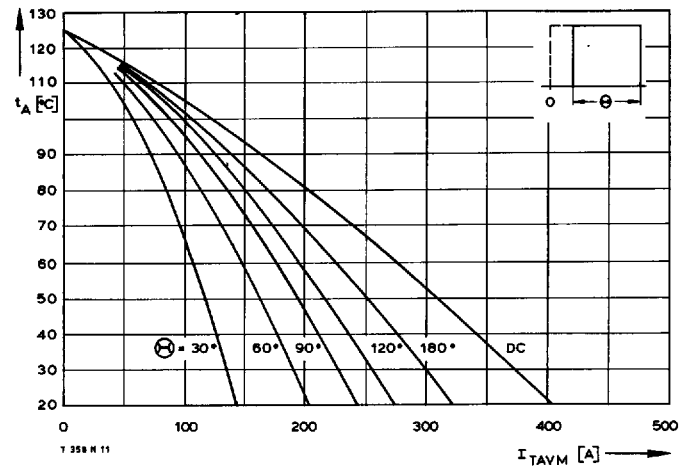
Bild/Fig. 9  
 Höchstzulässige Gehäusetemperatur  $t_c$  bei beidseitiger Kühlung  
 Maximum allowable case temperature  $t_c$  at two-sided cooling



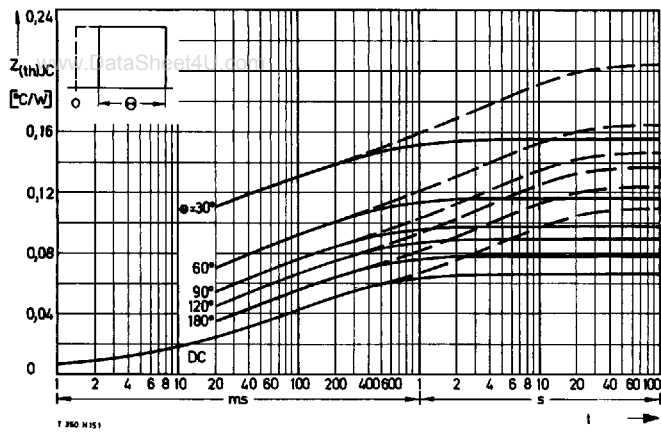
Bild/Fig. 10  
 Höchstzulässige Gehäusetemperatur  $t_c$  bei anodenseitiger Kühlung  
 Maximum allowable case temperature  $t_c$  at anode sided cooling



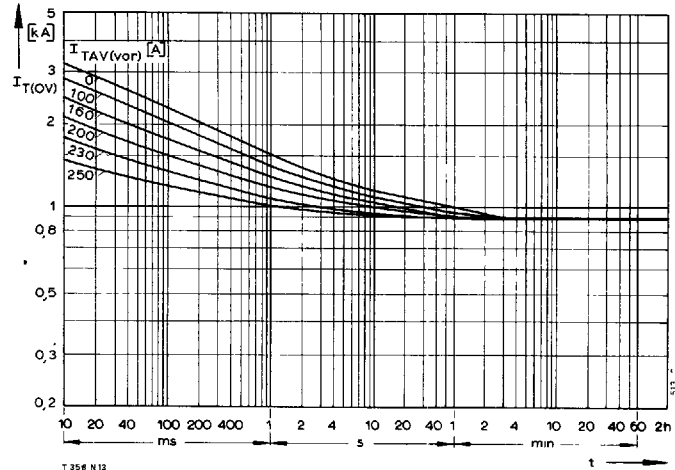
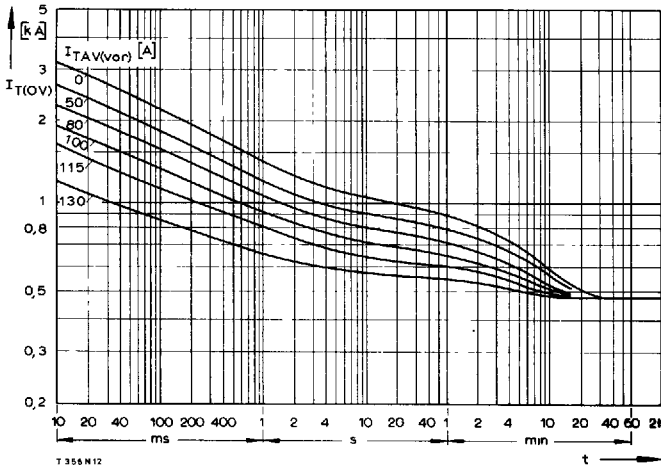
Bild/Fig. 11  
 Höchstzulässige Kühlmitteltemperatur  $t_A$  bei beidseitiger Luftselbstkühlung,  
 Kühlkörper K 0,36 S.  
 Maximum allowable cooling medium temperature  $t_A$  at natural two-sided cooling,  
 heatsink type K 0.36 S.



Bild/Fig. 12  
 Höchstzulässige Kühlmitteltemperatur  $t_A$  bei verstärkter beidseitiger Luftkühlung,  
 Kühlkörper K 0,12 F,  $V_L = 50$  l/s.  
 Maximum allowable cooling medium temperature  $t_A$  at forced two-sided cooling,  
 heatsink type K 0.12 F,  $V_L = 50$  l/s.

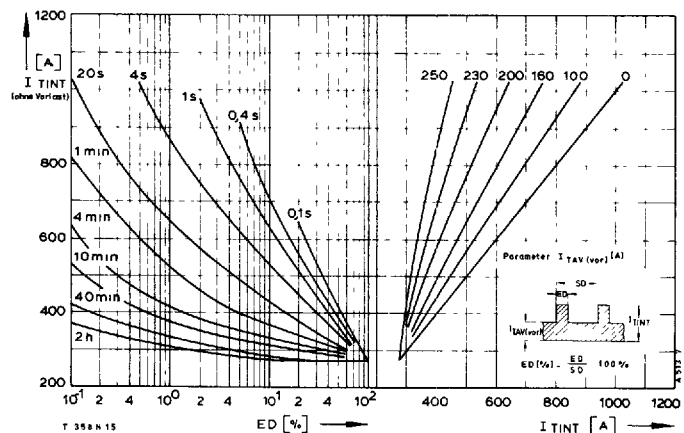
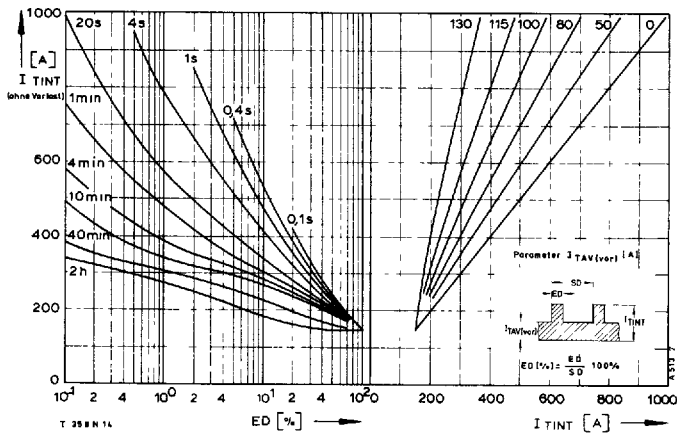


Bild/Fig. 13  
 Transienter innerer Wärmewiderstand  $Z_{(th)JC}$   
 Transient thermal impedance, junction case,  $Z_{(th)JC}$   
 - - - - - anodenseitige Kühlung/anode sided cooling  
 ————— beidseitige Kühlung/two-sided cooling



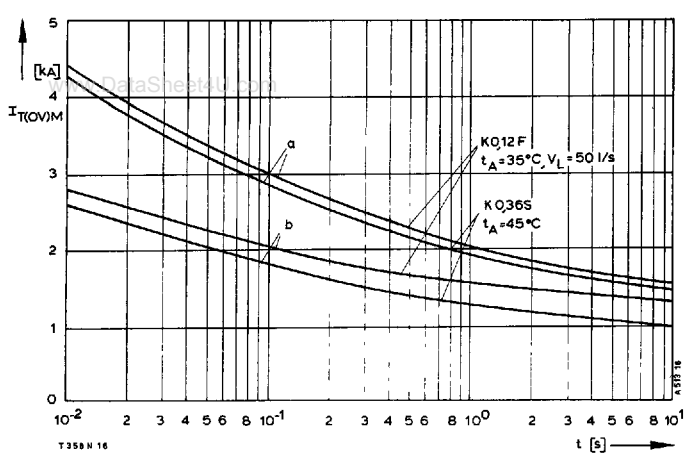
Bild/Fig. 14  
 Überstrom  $I_{T(OV)}$  bei beidseitiger Luftselbstkühlung,  $t_A = 45^\circ\text{C}$ ,  
 Kühlkörper K 0,36 S.  
 Overload on-state current  $I_{T(OV)}$  at natural two-sided cooling,  $t_A = 45^\circ\text{C}$ ,  
 heatsink type K 0.36 S.  
 Parameter: Vorlaststrom/pre-load current  $I_{TAV(vor)}$

Bild/Fig. 15  
 Überstrom  $I_{T(OV)}$  bei verstärkter beidseitiger Luftkühlung,  $t_A = 35^\circ\text{C}$ ,  
 Kühlkörper K 0,12 F,  $V_L = 50 \text{ l/s}$ .  
 Overload on-state current  $I_{T(OV)}$  at forced two-sided cooling,  $t_A = 35^\circ\text{C}$ ,  
 heatsink type K 0.12 F,  $V_L = 50 \text{ l/s}$ .  
 Parameter: Vorlaststrom/pre-load current  $I_{TAV(vor)}$

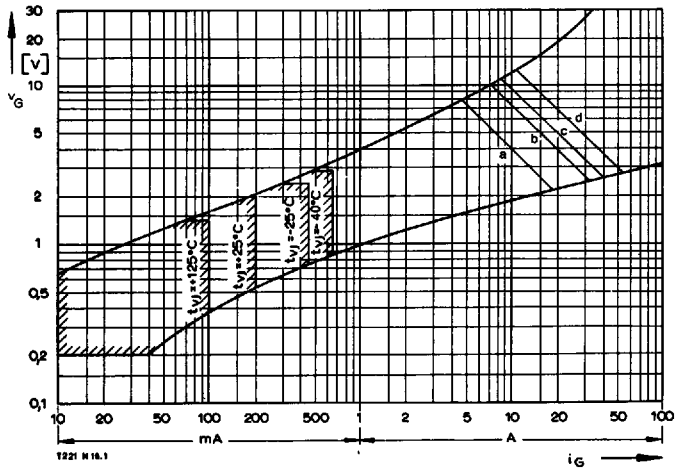


Bild/Fig. 16  
 Höchstzulässiger Durchlaßstrom  $I_{TINT}$  bei Aussetzbetrieb und beidseitiger  
 Luftselbstkühlung,  $t_A = 45^\circ\text{C}$ , Kühlkörper K 0,36 S.  
 Limiting on-state current  $I_{TINT}$  during intermittent operation at natural two-sided  
 cooling,  $t_A = 45^\circ\text{C}$ , heatsink type K 0.36 S.  
 Parameter: Spieldauer/cycle duration SD  
 Vorlaststrom/pre-load current  $I_{TAV(vor)}$

Bild/Fig. 17  
 Höchstzulässiger Durchlaßstrom  $I_{TINT}$  bei Aussetzbetrieb und verstärkter  
 beidseitiger Luftkühlung,  $t_A = 35^\circ\text{C}$ , Kühlkörper K 0,12 F,  $V_L = 50 \text{ l/s}$ .  
 Limiting on-state current  $I_{TINT}$  during intermittent operation at forced two-sided  
 cooling,  $t_A = 35^\circ\text{C}$ , heatsink type K 0.12 F,  $V_L = 50 \text{ l/s}$ .  
 Parameter: Spieldauer/cycle duration SD  
 Vorlaststrom/pre-load current  $I_{TAV(vor)}$

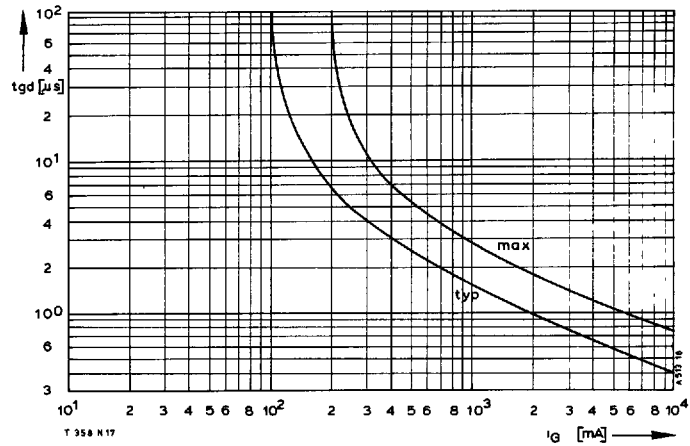


**Bild/Fig. 18**  
 Grenzstrom  $I_{T(OV)M}$  bei beidseitiger Kühlung, Kühlkörper K 0,36 S und K 0,12 F,  $V_{RM} = 0,8 V_{RRM}$ .  
 Limiting overload on-state current  $I_{T(OV)M}$  at two-sided cooling, heatsink type K 0.36 S and K 0.12 F,  $V_{RM} = 0.8 V_{RRM}$ .  
 a – Belastung aus Leerlauf/current surge under no-load conditions  
 b – Belastung im Anschluß an Betrieb mit Dauergrenzstrom  $I_{T(M)}$ / current surge occurs during operation at limiting mean on-state current rating  $I_{T(M)}$

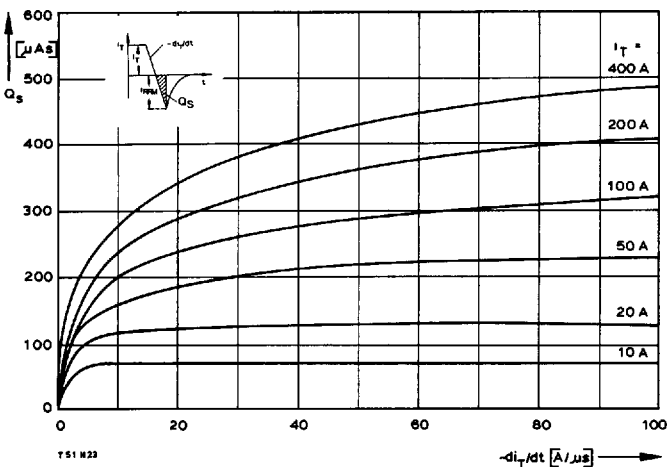


**Bild/Fig. 19**  
 Zündbereich und Spitzensteuerleistung bei  $v_D \geq 6$  V.  
 Gate characteristic and peak gate power dissipation at  $v_D \geq 6$  V.

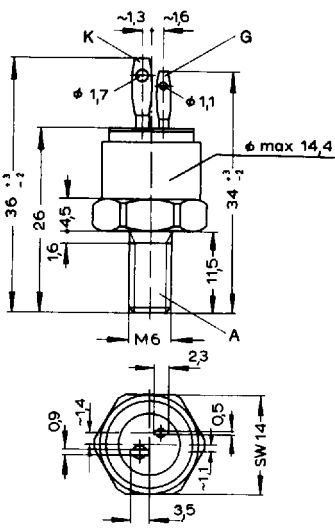
| Parameter:  | a       | b  | c   | d   |
|---|---------|----|-----|-----|
| Steuerimpulsdauer/Pulse duration $t_g$                                      | [ms] 10 | 1  | 0,5 | 0,1 |
| Höchstzulässige Spitzensteuerleistung/<br>Maximum allowable peak gate power | [W] 40  | 80 | 100 | 150 |



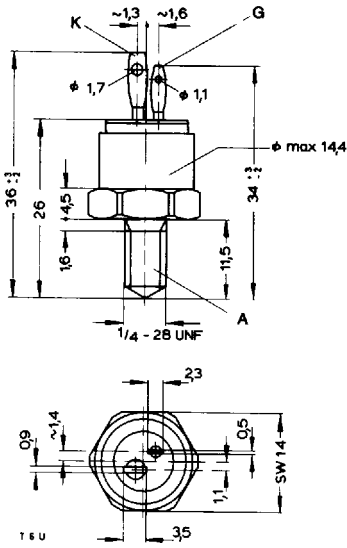
**Bild/Fig. 20**  
 Zündverzögerung  $t_{gd}$  bei  $i_{TM} = 100$  A,  $t_{vj} = 25^\circ\text{C}$ .  
 Gate controlled delay time  $t_{gd}$  at  $i_{TM} = 100$  A,  $t_{vj} = 25^\circ\text{C}$ .



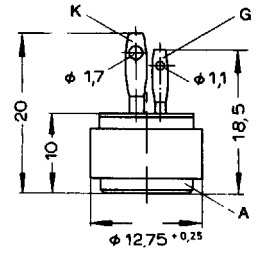
**Bild/Fig. 21**  
 Nachlaufladung  $Q_S$  in Abhängigkeit von der abkommutierenden Stromsteilheit  $-di_T/dt$  bei  $t_{vj} \text{ max}$ .  
 Lag charge  $Q_S$  versus the rate of decay of the forward on-state current  $-di_T/dt$  at  $t_{vj} \text{ max}$ .



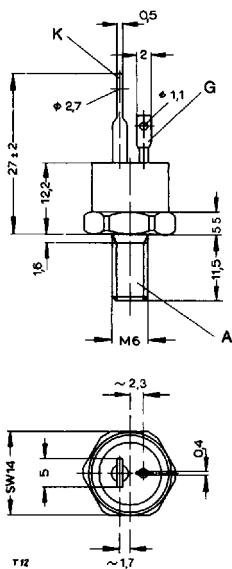
T 7 N...C  
T 10 N...C  
T 13 N...C



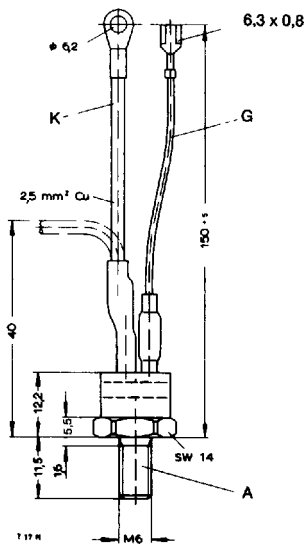
T 7 N...U  
T 10 N...U  
T 13 N...U



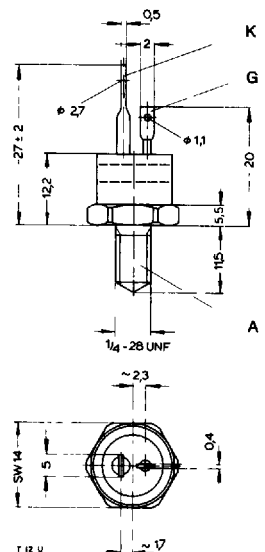
T 7 N...H  
T 10 N...H  
T 13 N...H



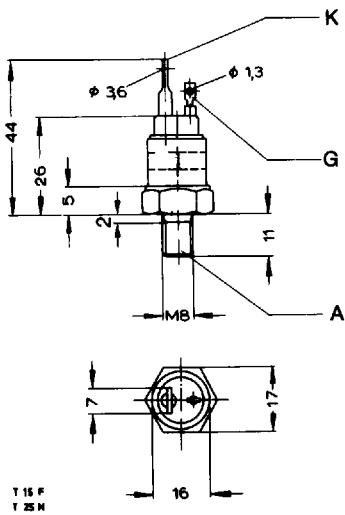
T 12 N...C  
T 15.1 N...C  
T 17 N...C  
T 24 N...C  
T 31 N...C



T 17 N...B  
T 24 N...B  
T 31 N...B



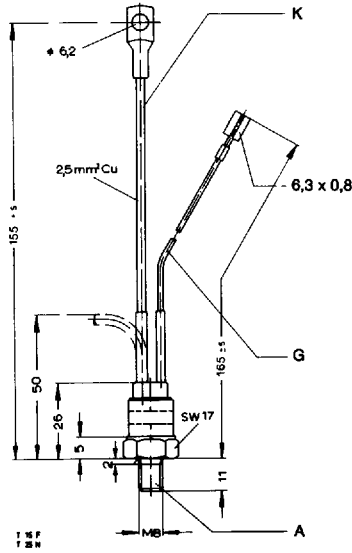
T 12 N...U  
T 15.1 N...U  
T 17 N...U  
T 31 N...U



T 15 F  
T 25 N

7

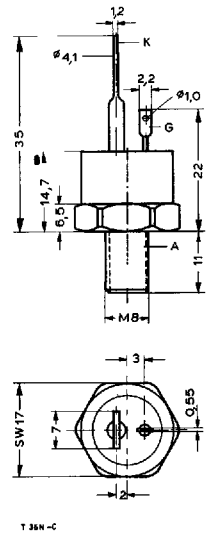
T 16 N...C  
T 25 N...C



T 15 F  
T 25 N

8

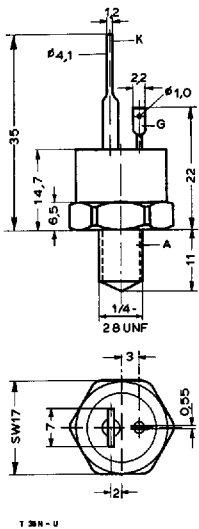
T 16 N...B  
T 25 N...B



T 36 N-C

9

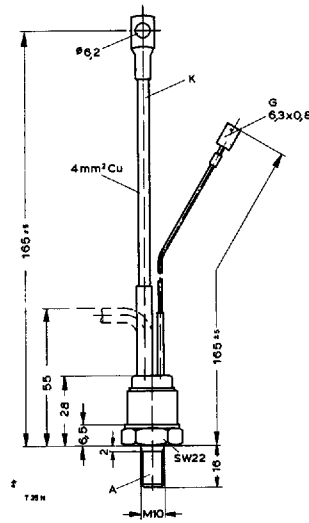
T 36 N...C  
T 46 N...C



T 36 N-U

10

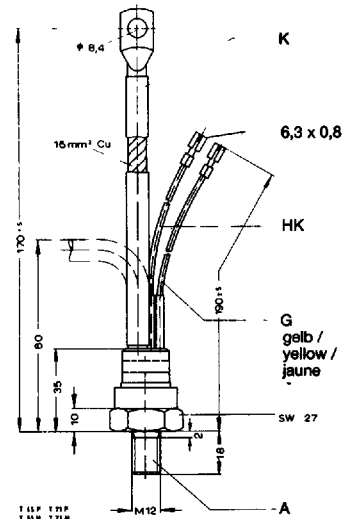
T 36 N...U  
T 46 N...U



T 35 N

11

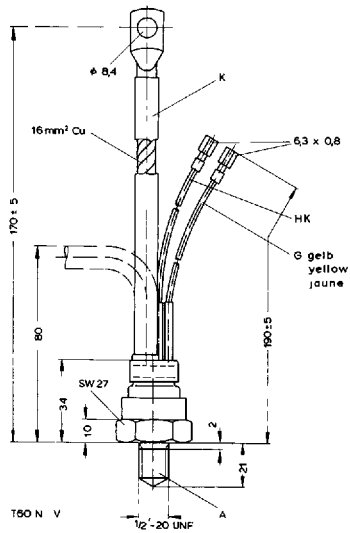
T 35 N...B  
T 45 N...B



T 60 N  
T 65 N  
T 115 N

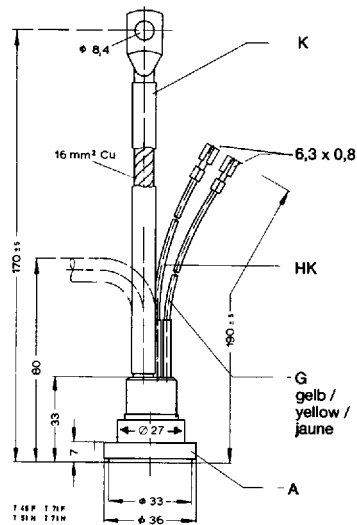
12

T 60 N...B  
T 65 N...B  
T 115 N...B



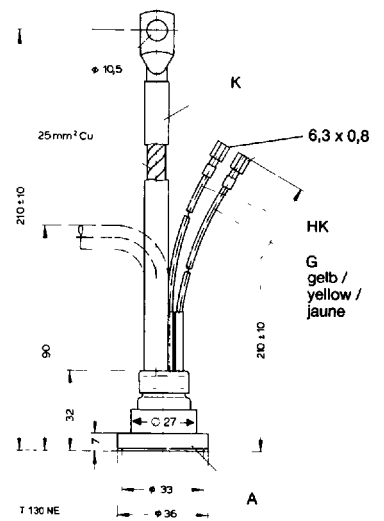
13

T 60 N...V  
T 85 N...V  
T 115 N...V



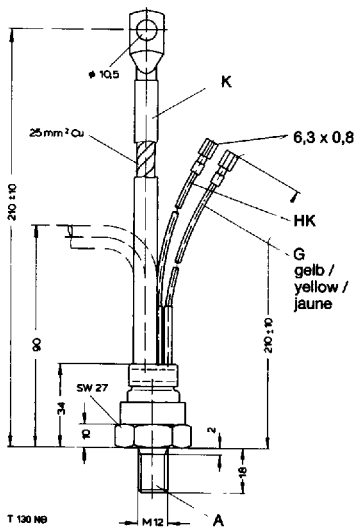
14

T 115 N...E



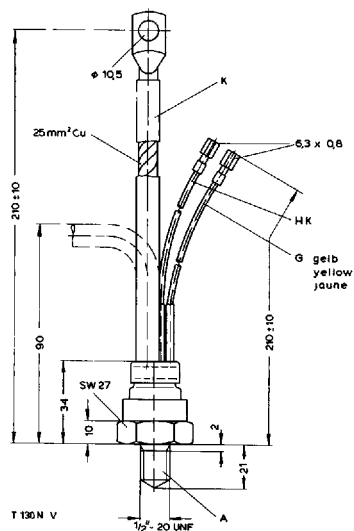
15

T 130 N...E  
T 160 N...E



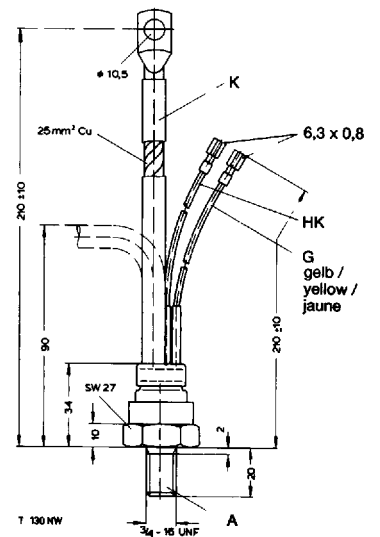
16

T 130 N...B  
T 160 N...B  
T 210 N...B



17

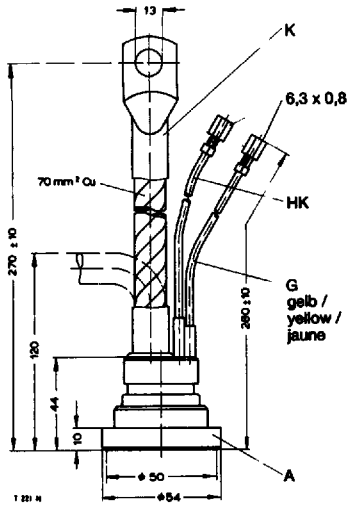
T 130 N...V  
T 160 N...V  
T 210 N...V



18

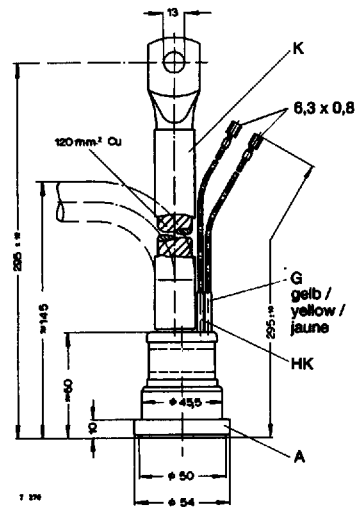
T 130 N...W  
T 160 N...W  
T 210 N...W





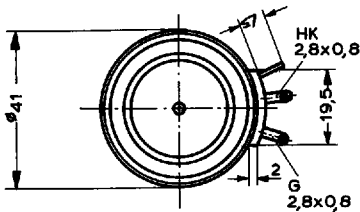
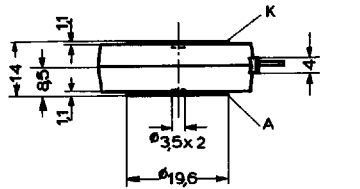
19

T 175 N  
T 221 N  
T 235 N  
T 236 N  
T 345 N



20

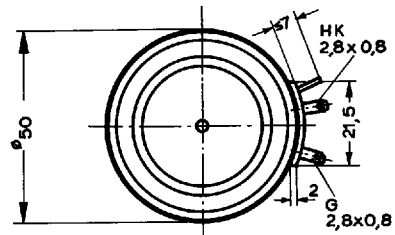
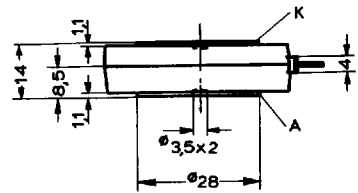
T 270 N



T 178 N

21

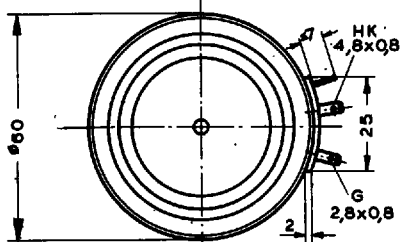
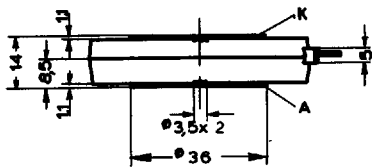
T 178 N  
T 198 N  
T 218 N  
T 298 N  
T 348 N  
T 358 N  
T 398 N



T 268 N

22

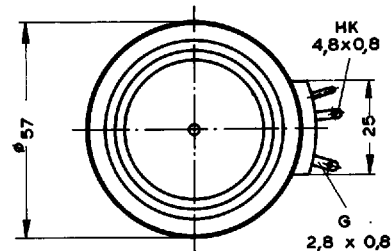
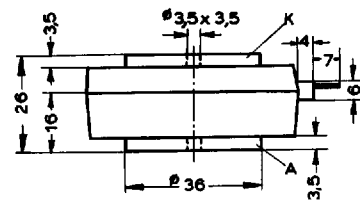
T 308 N  
T 388 N  
T 508 N  
T 588 N  
T 828 N



T 768 N

23

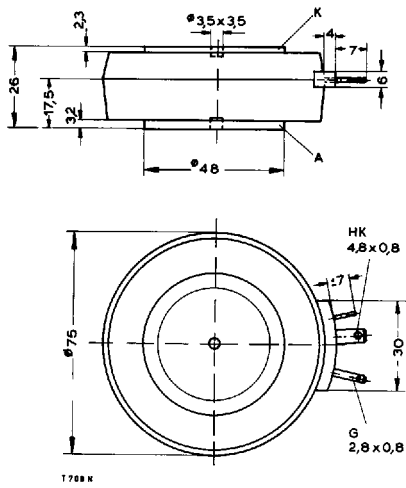
T 718 N  
T 1258 N



T 718 N

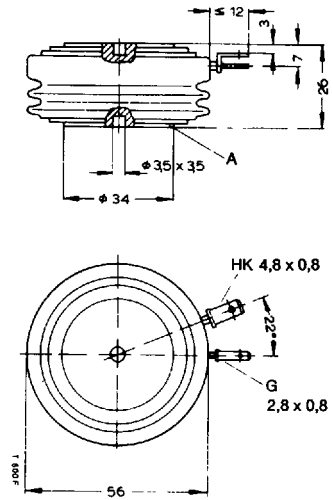
24

T 459 N  
T 509 N  
T 529 N  
T 719 N  
T 1259 N



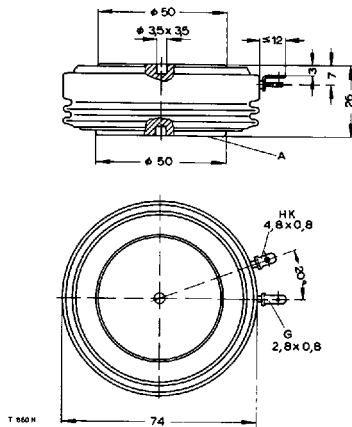
25

T 709 N  
T 869 N  
T 949 N  
T 1059 N  
T 1099 N  
T 1209 N



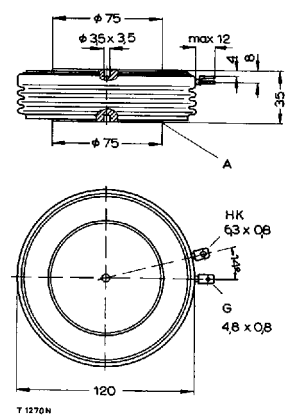
26

T 380 N



27

T 625 N  
T 860 N  
T 1050 N  
T 1200 N



28

T 1270 N  
T 1580 N  
T 1900 N