ASEA

Electronics Division

Information YS 170-302 E
YFB June 1976
Reg. 4855
Edition 1

High-power thyristors YST 14-22

Convertor type

The YST 14-22 thyristor features pressure contacts, and is suitable for single or double sided cooling. The component is either available preassembled in heat sink YAP 3-05 or YAP 8-02 or ready-to-mount with e.g. ASEA mounting clamps YSM 14-01 for single sided cooling or YSM 14-02 for double sided cooling.

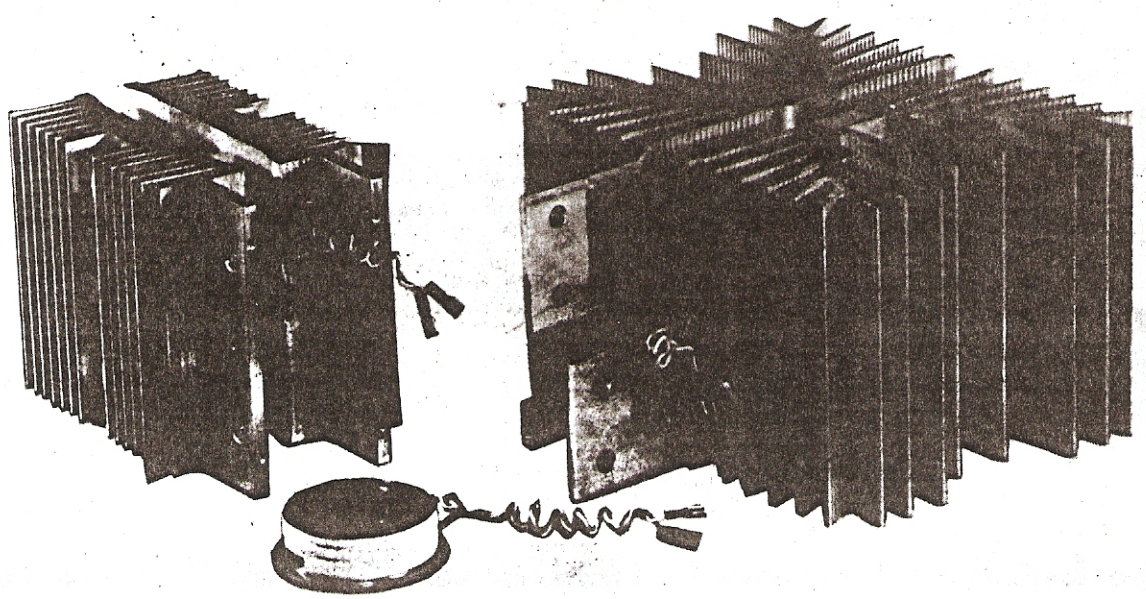
The thyristor is intended for use in ordinary power convertors connected to normal a.c. networks.

R.M.S. on-state current	1 250 A
Mean on-state current	800 A
Surge non-repetitive on-state current,	max. 15 000 A

Less powerlosses in RC-protection and reactors due to high critical rate of rise of off-state voltage, $(du_D/dt)_{crit}$ = 500 V/µs

Peak reverse voltage max. 2 600 V

Low thermical resistance
R_{thjc} = 0.03 K/W
All diffused



	Quantity symbol	Quantity		Unit	On-state class K2
On-state	I_{TRMS}	R.M.S. on-state current (θ_{case} = +70 °C, 180 °el sine wave)		A	1 250
	I_{TAV}	Mean on-state current	With case temperature θ_{case} = +70 °C	A	800
		Sine wave 180 °el	Heat sink YAP 3-05, 100 dm^3/s air at +40 °C	A	510
			Heat sink YAP 8-02, 250 dm^3/s air at +40 °C	A	590
		Square wave 120 °el	Heat sink YAP 3-05, 100 dm^3/s air at +40 °C	A	480
			Heat sink YAP 8-02, 250 dm^3/s air at +40 °C	A	560
	I_{TSM}	Surge non-repetitive on-state current (one-cycle sinusoidal) $\theta_{(vj)}$ = +125 °C	10 ms	A	15 000
			8.3 ms	A	15 800
		i^2t for fusing related to I_{TSM}, 10 ms, $\theta_{(vj)}$ = +125 °C		A^2s	1 125 000
		i^2t for fusing related to I_{TSM}, 3.5 ms, $\theta_{(vj)}$ = +125 °C		A^2s	885 000
	$U_{T(TO)}$	On-state threshold voltage, $\theta_{(vj)}$ = +125 °C		V	0.89
	r_T	On-state slope resistance at 600-1800 A on-state current		mΩ	0.41
Gate	U_{GD}	Gate non-trigger voltage at $\theta_{(vj)}$ = +125 °C		V	0.2
	I_{GD}	Gate non-trigger current at $\theta_{(vj)}$ = +125 °C		mA	5
	U_{FGM}	Max. peak forward gate voltage		V	6.5
	I_{FGM}	Max. peak forward gate current		A	3.5
	U_{RGM}	Max. peak reverse gate voltage		V	10
	P_{Gmax}	Max. mean gate power loss		W	3
Dynamic	$\left(\frac{di_T}{dt}\right)_{crit}$	Critical rate of rise of on-state current I_{TRM} = 2 000 A, U_D = 0.67 x U_{DM}, $\theta_{(vj)}$ = +125 °C Gate supply: I_{FGM} = 1.5 A, t_{rise} = 0.5 µs		A/µs	75
	t_d	Gate controlled delay time U_D = 0.4 x U_{DM} Gate supply: I_{FGM} = 1.5 A, t_{rise} = 0.5 µs		µs	0.9
Thermal	$\theta_{(vj)}$	Virtual junction temperature		°C	-40 to +125
	θ_{stg}	Storage temperature		°C	-40 to +125
	R_{th}	Thermal resistance d.c.			
		Double side cooling	Junction to case	K/W	0.03
			Case to heat sink	K/W	0.01
			Junction to air with YAP 3-05, 100 dm^3/s	K/W	0.11
			Junction to air with YAP 8-02, 250 dm^3/s	K/W	0.09
		Single (anode) side cooling	Junction to case	K/W	0.065
			Case to heat sink	K/W	0.02
Mechanical	F	Mounting force		N	16 000 ± 2 000
	m	Mass (weight)	without heat sink	kg	0.6
			with heat sink YAP 3-05	kg	4.6
			with heat sink YAP 8-02	kg	8.5

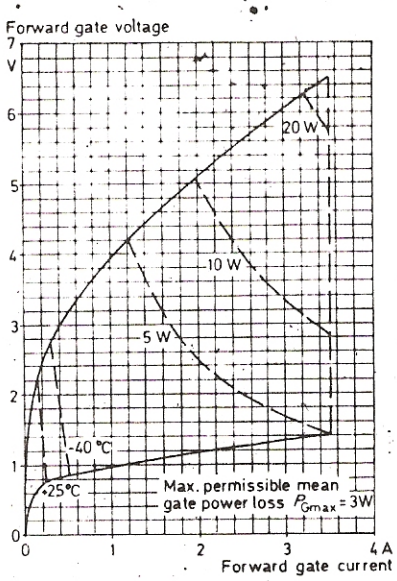


Fig. 1 Gate trigger characteristics with lower limits of certain triggering

Anode-cathode voltage
2.5 V at $\vartheta_{(vj)} > -30$ °C
6.0 V at -30 °C $\geq \vartheta_{(vj)} \geq -40$ °C

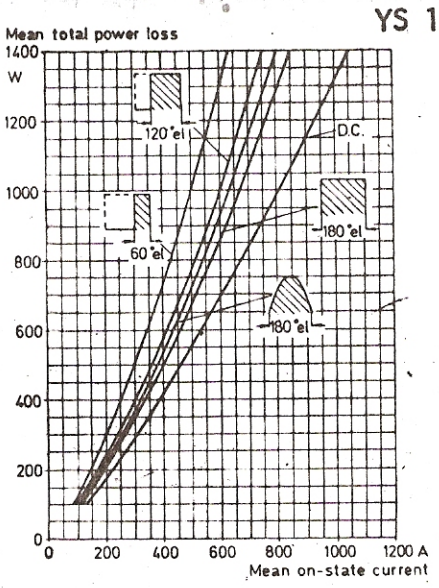


Fig. 2 Total power loss.
On-state class K2. $\vartheta_{(vj)}$ = +125 °C

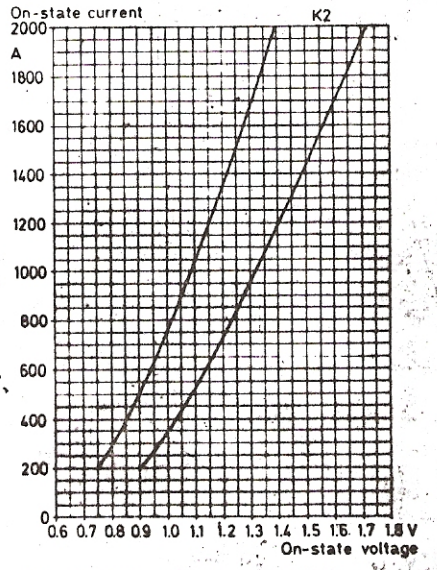


Fig. 3 On-state characteristics.
Normal current range. $\vartheta_{(vj)}$ = +125 °C

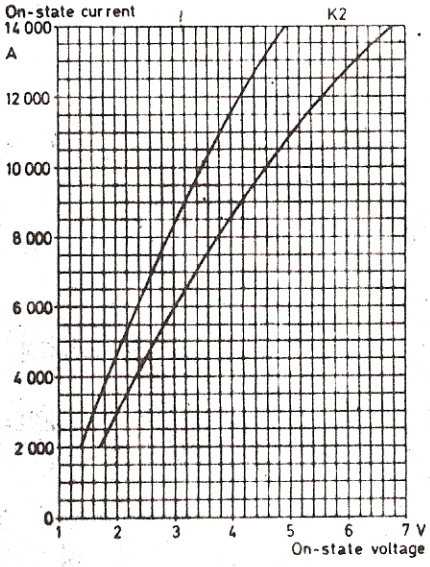


Fig. 4 On-state characteristics.
High current range. $\vartheta_{(vj)}$ = +125 °C

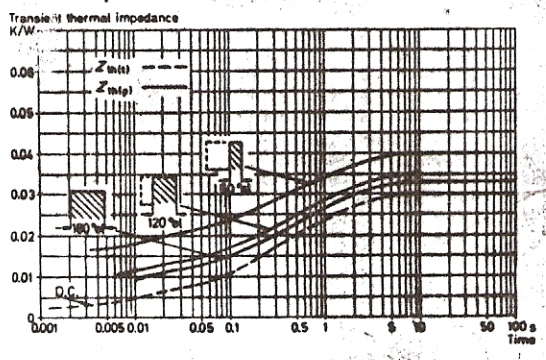


Fig. 5 Transient thermal impedance.
Junction to case.
Double side cooling.

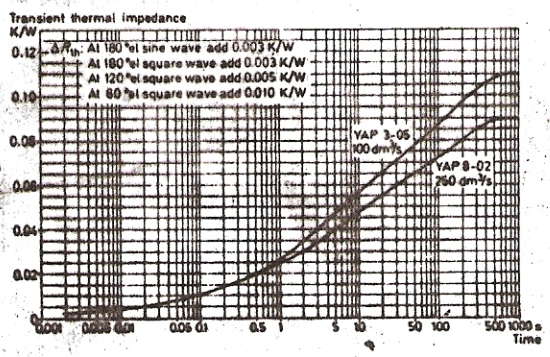


Fig. 6 Transient thermal impedance.
Junction to ambient air.
Heat sink YAP 8-02 air flow 250 dm^3/s,
and YAP 3-05 air flow 100 dm^3/s.

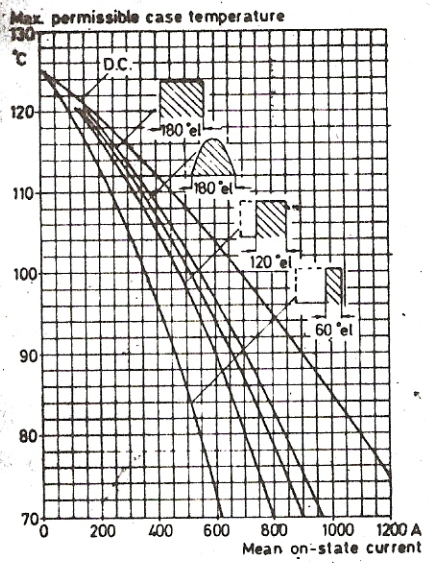


Fig. 7 Max. permissible case temperature.
On-state class K2. Double side cooling.

Dimensions

Dimensions are given in millimetres

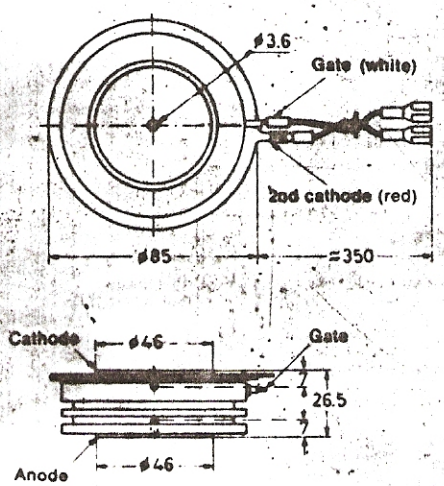


Fig. 8 Thyristor YST 14-22

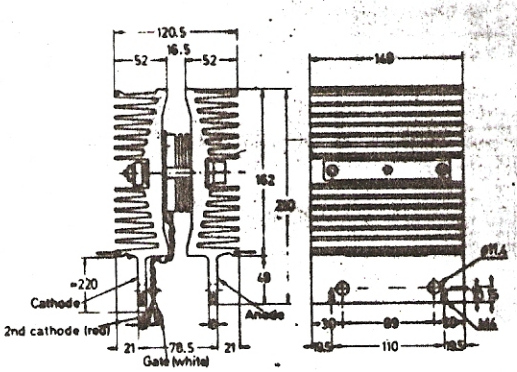


Fig. 9 Thyristor YST 14-22
with heat sink YAP 3-05

Cat. No. and mass (weight)

Type	$(du_D/dt)_{crit}$ V/µs	Cat. No.	Mass excl. packing kg	Heat sink
YST 14-22	500	YS 170 004-C	0.6	-
YST 14-22	500	YS 170 005-C	4.6	YAP 3-05
YST 14-22	500	YS 170 006-C	8.6	YAP 8-02

Voltage and on-state class

Voltage-class	Peak reverse voltage U_{RM} V	Peak off-state voltage U_{DM} V	Min. breakover voltage for du_D/dt test V	On-state
P20	2 000	2 000		
P22	2 200	2 200	70 % of U_{DM}	K2
P24	2 400	2 400		
PR22	2 200	2 000		
PR24	2 400	2 200	70 % of U_{DM}	K2
PR26	2 600	2 400		

Rated values for peak reverse and peak-off-state voltage are the highest permissible instantaneous values including all repetitive and non-repetitive transient voltages.

To obtain satisfactory service it is recommended that the crest working voltage does not exceed 70 per cent of rated peak voltage values. Normal practice is to choose the voltage class rating so that a safety factor of 2-2.5 for the crest working voltage is achieved in order to include expected transient voltages in thyristor convertor circuits.

Ordering example

Wanted: six YST 14-22. U_{RM} = 2 400 V, U_{DM} = 2 200 V, on-state class = K2, $(du_D/dt)_{crit}$ = 500 V/µs

6 YS 170 004-C YST 14-22 PR24 K2 Thyristors

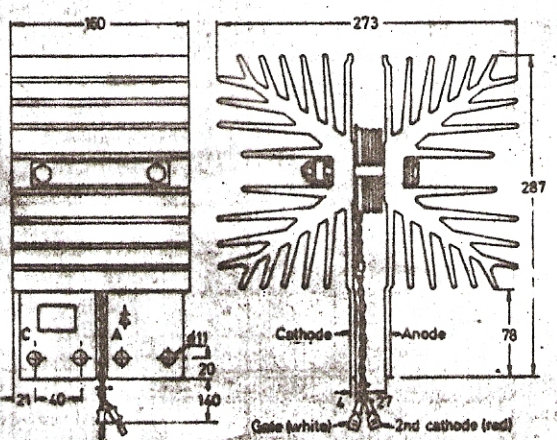


Fig. 10 Thyristor YST 14-22
with heat sink YAP 8-02