Appendix:

STANAG 4582

Measurement Duration and Heat Flow Limits

Measurement times (t_m) and heat flow limits (P_1) for temperatures 60–90°C recommended in the STANAG 4582 procedure.

Table 14: Values taken from STANAG 4582

T_m [°C]	**t_m [days]**	**P_1 [µW/g]**	**T_m [°C]**	**t_m [days]**	P_1 [µW/g]
60	123	9.8	76	16.9	71.1
61	108	11.1	77	15	80
62	95	12.6	78	13.4	90
63	83.6	14.4	79	11.9	101
64	73.6	16.3	80	10.6	114
65	64.9	18.5	81	9.43	127
66	57.2	21	82	8.41	143
67	50.5	23.8	83	7.5	160
68	44.6	27	84	6.7	179
69	39.4	30.5	85	5.98	201
70	34.8	34.5	86	5.35	225
71	30.8	39	87	4.78	251
72	27.3	44	88	4.28	281
73	24.2	49.7	89	3.83	314
74	21.5	56	90	3.43	350
75	19	63.1			

STANAG Safety Issues

There is always demand to be extra cautious when working with propellants. As the decomposition reaction proceeds and the concentration of gases increases there will be a corresponding pressure increase inside the sealed ampoule. Naturally there might be a risk for personal injury when handling the ampoules after a measurement. The pressure inside the ampoule will decrease a little when bringing the temperature down to ambient. However, this is merely a 10% decrease or less if the measurement was performed at 90°C. It is recommended to carefully penetrate the teflon/rubber gasket with a thin hollow needle (e.g. an injection needle) in order to release the pressure in the ampoule. This should be done with the ampoule positioned inside some kind of safety cabinet.

Another complication that might arise is the possibility that the aluminium cap swells due to the pressure increase and the ampoule may get stuck inside the measuring position. This may make the ampoule impossible to remove without severe damage to the lifting tool and possibly the calorimeter. If this occurs it is strongly advised to lower the temperature of the TAM III to ambient temperature and wait to see if the pressure decrease will allow for the ampoule to be removed. If no luck removing the ampoule please contact TA Instruments service for assistance.

WARNING! Due to safety it is advisable to stop a measurement and remove the ampoule when the total heat produced reaches 150 J.

References

For more in depth reading on the basis of the STANAG 4582 standard, please see reference [1] and [2].

1 U. Ticmanis, S. Wilker, G. Pantel, P. Guillaume, C. Balès, N. van der Meer. Principles of a STANAG for the estimation of the chemical stability of propellants by Heat Flow Calorimetry", Proc. Int Annu. Conf. ICT 31, 2 (2000).

2 P. Guillaume, M. Rat, S. Wilker, G. Pantel, "Microcalorimetric and Chemical Studies of Propellants", Proc. Int Annu. Conf. ICT 29, 133 (1998).

3 STANAG 4582: Explosives, nitrocellulose based propellants, stability test procedure and requirements using heat flow calorimetry.

4 TAM III Quickstart Presentation