

# Ferrotec Nord Corp.

## PRODUCT GENERAL SPECIFICATION

Last update: January 01, 2013

### ONE-STAGE STANDARD MODULES

MODULE TYPE	BASIC CHARACTERISTICS, Th=25 °C, VACUUM ENVIRONMENT				DIMENSIONS, mm		
	I <sub>max</sub> , A	U <sub>max</sub> , V	Q <sub>cmax</sub> , W	ΔT <sub>max</sub> , °C	Cold side	Hot side	Height
TM-17-1.0-2.5	2.5	2.0	3	72	12 × 12	12 × 12	4.2
TM-31-1.0-2.5	2.5	3.6	5.7	72	15 × 15	15 × 15	4.2
TM-63-1.0-2.5	2.5	7.2	11.6	72	15 × 30	15 × 30	4.2
TM-71-1.0-2.5	2.5	8.2	13	72	22.4 × 22.4	22.4 × 22.4	4.2
TM-127-1.0-2.5	2.5	14.6	23.5	72	30 × 30	30 × 30	4.2
TM-17-1.0-3.0	3.0	2.0	3.3	72	12 × 12	12 × 12	3.8
TM-23-1.0-3.0 *	3.0	2.6	5.3	72	15 × 15	15 × 15	3.6
TM-31-1.0-3.0	3.0	3.6	7.2	72	15 × 15	15 × 15	3.8
TM-63-1.0-3.0	3.0	7.2	14.6	72	15 × 30	15 × 30	3.8
TM-63-0.8-3.0	3.0	7.2	13.0	72	15 × 30	15 × 30	3.4
TM-71-1.0-3.0	3.0	8.2	16.5	72	22.4 × 22.4	22.4 × 22.4	3.8
TM-127-1.0-3.0	3.0	14.6	29	72	30 × 30	30 × 30	3.8
TM-127-0.9-3.0	3.0	14.6	29	72	30 × 30	30 × 30	3.4
TM-241-1.0-3.0	3.0	27.7	56.0	72	40 × 40	40 × 40	3.8
TM-450-0.8-3.0	3.0	51.7	101	72	54.4 × 54.4	54.4 × 57.0	3.4
TM-17-1.4-3.7	3.7	2.0	4.6	72	15 × 15	15 × 15	4.7
TM-31-1.4-3.7	3.7	3.6	8.4	72	20 × 20	20 × 20	4.7
TM-35-1.4-3.7	3.7	4.0	9.5	72	15 × 30	15 × 30	4.7
TM-63-1.4-3.7	3.7	7.2	17.0	72	20 × 40	20 × 40	4.7
TM-71-1.4-3.7	3.7	8.2	19.3	72	30 × 30	30 × 30 30 × 34	4.7
TM-127-1.4-3.7	3.7	14.6	34.5	72	40 × 40	40 × 40 40 × 44	4.7
TM-17-1.0-3.9	3.9	2.0	4.9	72	12 × 12	12 × 12	3.6
TM-31-1.0-3.9	3.9	3.6	8.9	72	15 × 15	15 × 15	3.6
TM-63-1.0-3.9	3.9	7.2	18.0	72	15 × 30	15 × 30	3.6
TM-71-1.0-3.9	3.9	8.2	20.4	72	22.4 × 22.4	22.4 × 22.4	3.6
TM-127-1.0-3.9	3.9	14.6	36.6	72	30 × 30	30 × 30	3.6
TM-241-1.0-3.9	3.9	27.7	69	72	40 × 40	40 × 40	3.6
TM-17-1.4-6.0	6.0	2.0	7.4	72	15 × 15	15 × 15	3.8
TM-31-1.4-6.0	6.0	3.6	13.6	72	20 × 20	20 × 20	3.8
TM-35-1.4-6.0	6.0	4.0	15.3	72	15 × 30	15 × 30	3.8

MODULE TYPE	BASIC CHARACTERISTICS, $T_h=25\text{ }^\circ\text{C}$ , VACUUM ENVIRONMENT				DIMENSIONS, mm		
	$I_{\max}$ , A	$U_{\max}$ , V	$Q_{\text{cmax}}$ , W	$\Delta T_{\max}$ , $^\circ\text{C}$	Cold side	Hot side	Height
TM-63-1.4-6.0	6.0	7.2	27.7	72	20 × 40	20 × 40	3.8
TM-71-1.4-6.0	6.0	8.2	31	72	30 × 30	30 × 30	3.8
						30 × 34	
TM-127-1.4-6.0	6.0	14.6	55	72	40 × 40	40 × 40	3.8
						40 × 44	
TM-254-1.4-6.0	6.0	29.2	106	72	40 × 80	44 × 80	3.8
TM-257-1.4-6.0	6.0	29.5	110	72	∅ 62	∅ 62	4.16
TM-71-1.2-7.5	7.5	8.2	36	72	22.4 × 22.4	22.4 × 22.4	3.2
TM-127-1.2-7.5	7.5	14.6	62	72	30 × 30	30 × 30	3.2
					40 × 40	40 × 40	3.2
TM-35-1.4-8.0	8.0	4.0	19.0	72	15 × 30	15 × 30	3.4
TM-110-1.2-8.0	8.0	12.6	59	72	54.8 × 24.8	54.8 × 24.8	3.5
TM-144-1.2-8.0	8.0	16.6	81	72	16.2 × 72.4	16.8 × 76.7	2.7
TM-17-1.4-8.5	8.5	2.0	12	72	15 × 15	15 × 15	3.4
TM-31-1.4-8.5	8.5	3.6	18	72	20 × 20	20 × 20	3.4
TM-35-1.4-8.5	8.5	4.0	20.4	72	15 × 30	15 × 30	3.4
TM-63-1.4-8.5	8.5	7.2	37	72	20 × 40	20 × 40	3.4
TM-69-1.4-8.5 *	8.5	7.9	46	72	35 × 35	35 × 35	3.4
TM-71-1.4-8.5	8.5	8.2	41.4	72	30 × 30	30 × 30	3.4
						30 × 34	
TM-127-1.4-8.5	8.5	14.6	74	72	40 × 40	40 × 40	3.4
						40 × 44	
TM-241-1.4-8.5	8.5	27.7	135	72	54.4 × 54.4	54.4 × 57	3.4
TM-31-1.4-9.0	9.0	3.6	17.3	72	30 × 30	30 × 30	3.5
TM-32-2.0-9.0	9.0	3.6	21	72	25.4×25.4	25.4×28.4	4.8
TM-69-1.4-9.0	9.0	7.9	45	72	35 × 35	35 × 40	3.0
TM-71-1.4-9.0	9.0	8.2	46	72	30 × 30	30 × 30	3.4
TM-141-1.4-9.0	9.0	16.2	75	72	25 × 50	25 × 50	3.2
TM-153-1.4-9.0	9.0	17.6	93	72	30 × 55	30 × 55	3.9
TM-241-1.6-10.0	10.0	27.7	158	72	50 × 50	50 × 54	3.8
TM-71-2.0-12.0	12.0	8.2	63	72	40 × 40	40 × 40	3.8
TM-127-2.0-12.0	12.0	14.6	113	72	50 × 50	50 × 54	3.8
TM-32-2.0-15.0	15.0	3.7	35	72	25.4×25.4	25.4×28.4	3.6
TM-71-1.6-15.0	15.0	8.2	70	72	29.2 × 29.2	29.8 × 33.8	2.35
TM-71-2.0-15.0	15.0	8.2	77	72	40 × 40	40 × 40	3.6
TM-127-1.6-15.0	15.0	14.6	120	72	40 × 40	40 × 40	3.2
						40 × 44	
TM-127-2.0-15.0	15.0	14.6	110	72	50 × 50	50 × 54	3.6
TM-161-1.6-15.0	15.0	18.5	150	72	40 × 40	40 × 40	3.3
TM-241-1.6-15.0	15.0	27.7	230	72	50 × 50	50 × 54	3.6
TM-70-2.5-15.5	15.5	8.0	76	72	36,4 × 50.2	36.4 × 54.4	4.7
TM-75-2.5-20.0	20.0	8.6	115	72	37.4 × 54.8	37.4 × 59	3.2
TM-241-1.6-20.0	20.0	27.7	310	72	50 × 50	50 × 54	3.45
TM-70-2.5-24.0	24.0	8.0	115	72	36,4 × 50.2	36.4 × 54.4	3.2

MODULE TYPE	BASIC CHARACTERISTICS, Th=25 °C, VACUUM ENVIRONMENT				DIMENSIONS, mm		
	I <sub>max</sub> , A	U <sub>max</sub> , V	Q <sub>cmax</sub> , W	ΔT <sub>max</sub> , °C	Cold side	Hot side	Height
TM-241-1.6-28.0	28.0	27.7	430	72	50 × 50	50 × 54	3.25
TM-18-5.0-60.0	60.0	2.1	78	72	40 × 40	40 × 40	4.5
TM-18-5.0-75.0	75.0	2.1	95	72	40 × 40	40 × 40	4.2
TM-18-5.0-90.0	90.0	2.1	112	72	40 × 40	40 × 40	4.0

\* Module with a centre hole

\*\* Round shape module

## ONE-STAGE MODULES FOR CYCLING APPLICATION

MODULE TYPE	CHARACTERISTICS, Th=25 °C, VACUUM ENVIRONMENT				DIMENSIONS, mm		
	I <sub>max</sub> , A	U <sub>max</sub> , V	Q <sub>cmax</sub> , W	ΔT <sub>max</sub> , °C	Cold side	Hot side	Height
AVAILABLE TMC VERSIONS							
TMC-31-1.0-3.9 M	3.9	3.6	8.9	72	15 × 15	15 × 15	3.6
TMC-71-1.0-3.9 M	3.9	8.2	20.4	72	22.4 × 22.4	22.4 × 22.4	3.6
TMC-127-1.0-3.9 M	3.9	14.6	36.6	72	30 × 30	30 × 30	3.6
TMC-71-1.4-6.0 M	6.0	8.2	30	71	30 × 30	30 × 30 30 × 34	3.8
TMC-127-1.4-6.0 M	6.0	14.6	53	71	40 × 40	40 × 40 40 × 44	3.8
TMC-144-1.2-8.0 M	8.0	16.6	78	71	16.2 × 72.4	16.8 × 76.7	2.7
TMC-69-1.4-8.5 M*	8,5	7.9	43	71	35 × 35	35 × 35	3.4
TMC-71-1.4-8.5 M	8.5	8.2	40	71	30 × 30	30 × 30 30 × 34	3.4
TMC-127-1.4-8.5 M	8.5	14.6	71	71	40 × 40	40 × 40 40 × 44	3.4
TMC-32-2.0-9.0 M	9.0	3.6	21	72	25.4×25.4	25.4×28.4	4.8
TMC-69-1.4-9.0 M	9,0	7.9	43	71	35 × 35	35 × 40	3,0
TMC-71-1.4-9.0 M	9.0	8.2	44	71	30 × 30	30 × 30	3.4
TMC-71-1.6-15.0 M	15.0	8.2	67	71	29.2 × 29.2	29.8 × 33.8	2.35
TMC-127-1.6-15.0 M	15.0	14.6	115	71	40 × 40	40 × 40 40 × 44	3.2
TMC-161-1.6-15.0 M	15.0	18.5	148	71	40 × 40	40 × 40	3.3
TMC-241-1.6-15.0 M	15.0	27.7	225	71	50 × 50	50 × 54	3.6
TMC-32-2.0-15.0 M	15.0	3.7	34	71	25.4×25.4	25.4×28.4	3.6
TMC-70-2.5-15.5 M	15.5	8.0	73	71	36,4 × 50.2	36.4 × 54.4	4,7
TMC-70-2.5-24.0 M	24.0	8.0	110	71	36,4 × 50.2	36.4 × 54.4	3.2

\* Module with a centre hole

## TWO-STAGE STANDARD MODULES

MODULE TYPE	BASIC CHARACTERISTICS, $T_h=25\text{ }^\circ\text{C}$ , VACUUM ENVIRONMENT				DIMENSIONS, mm		
BASIC VERSION	$I_{\max}$ , A	$U_{\max}$ , V	$Q_{c\max}$ , W	$\Delta T_{\max}$ , $^\circ\text{C}$	Cold side	Hot side	Height
2TM-127-31-5.0	5.0	15.5	17	95	40 x 40	40 x 40	11.7
2TM-127-63-6.5	6.5	16.0	35	86	40 x 40	40 x 40	7.5

## ONE-STAGE MICROMODULES

TYPE	BASIC CHARACTERISTICS, $T_h=25\text{ }^\circ\text{C}$ , VACUUM ENVIRONMENT				DIMENSIONS, mm		
	$I_{\max}$ , A	$U_{\max}$ , V	$Q_{\max}$ , W	$\Delta T_{\max}$ , $^\circ\text{C}$	Cold side	Hot side	Height
TM-7-0.3-0.3	0.3	0.8	0.15	72	2.0 x 2.0	2.0 x 3.0	1.79
TM-8-0.3-0.3	0.3	0.9	0.15	72	2.0 x 2.0	2.0 x 3.0	1.79
TM-2-0.3-0.5	0.5	0.23	0.07	72	1.2 x 1.2	1.2 x 1.5	1.5
TM-11-0.4-1.1	1.1	1.26	0.88	72	6.4 x 2.4	6.4 x 2.4	1.65
TM-4-0.6-1.2	1.2	0.5	0.32	72	2.0 x 4.0	2.0 x 4.0	2.6
TM-8-0.6-1.2	1.2	0.9	0.65	72	4.0 x 4.0	4.0 x 6.0	2.6
TM-12-0.6-1.2	1.2	1.4	1.0	72	4.0 x 6.0	4.0 x 6.0	2.6
TM-18-0.6-1.2	1.2	2.1	1.5	72	6.0 x 6.0	6.0 x 8.1	2.6
TM-32-0.6-1.2	1.2	3.7	2.6	72	8.0 x 8.0	8.0 x 10.0	2.6
TM-18-0.4-1.4	1.4	2.1	1.6	72	3.8 x 3.8	3.8 x 5.0	1.15
TM-4-0.6-1.5	1.5	0.5	0.4	72	2.0 x 4.0	2.0 x 4.0	2.3
TM-8-0.6-1.5	1.5	0.9	0.8	72	4.0 x 4.0	4.0 x 6.0	2.3
TM-12-0.6-1.5	1.5	1.4	1.3	72	4.0 x 6.0	6.0 x 6.0	2.3
TM-18-0.6-1.5	1.5	2.1	1.9	72	6.0 x 6.0	6.0 x 8.1	2.65
TM-32-0.6-1.5	1.5	3.7	3.3	72	8.0 x 8.0	8.0 x 10.0	2.6
TM-30-0.7-1.8	1.8	3.3	3.8	72	8.0 x 10.3	8.0 x 15.4	2.2
TM-8-0.5-2.0	2.0	0.9	1.1	72	4.0 x 4.0	4.0 x 5.0	1.0
TM-18-0.6-2.0	2.0	2.1	2.5	72	6.0 x 6.0	6.0 x 7.2	1.65
TM-23-0.6-2.0	2.0	2.6	3.1	72	6.0 x 8.2	6.0 x 8.2	1.65
TM-29-0.6-2.0	2.0	3.3	4.3	73	6.0 x 10.2	6.0 x 10.2	1.65
TM-47-0.6-2.0	2.0	5.4	6.5	72	8.0 x 12.0	8.0 x 12.0	1.6
TM-79-0.6-2.0	2.0	9.1	10.9	72	10.0 x 15.0	10 x 15.0	1.57
TM-32-0.6-2.2	2.2	3.7	4.7	72	8.0 x 10.0	8.0 x 10.0	2.58
TM-18-0.6-2.4	2.4	2.1	2.8	72	6.0 x 6.0	6.0 x 7.2	1.65
TM-29-0.6-2.4	2.4	3.3	4.6	72	6.0 x 10.2	6.0 x 10.2	1.65
TM-41-0.6-2.4	2.4	4.7	6.5	72	6.0 x 14.0	6.0 x 14.0	1.65
TM-119-0.6-2.4	2.4	13.7	18.9	72	10.0 x 24.0	10.0 x 24.0	1.65
TM-7-1.0-2.5	2.5	0.8	1.3	72	8.0 x 8.0	8.0 x 10.0	4.2
TM-35-0.7-2.8	2.8	4.0	7.0	72	6.0 x 12.2	6.0 x 12.2	1.7
TM-2-0.4-3.0	3.0	0.23	0.67	72	2.5 x 1.5	2.5 x 2.5	1.0
TM-7-1.0-3.0	3.0	0.8	1.5	72	8.0 x 8.0	8.0 x 10.0	3.8
TM-7-1.0-3.9	3.9	0.8	1.9	72	8.0 x 8.0	8.0 x 10.0	3.6
TM-95-0.6-3.9	3.9	10.9	22	72	12.0 x 16.0	12.0 x 16.0	1.65
TM-26-0.8-4.8	4.8	3.0	8.1	72	8.0 x 12.0	8.0 x 12.0	1.65
TM-29-0.8-4.8	4.8	3.3	9.0	72	8.0 x 12.2	8.0 x 12.2	1.65
TM-39-0.8-6.0	5.9	4.5	14.5	72	6.9 x 15.1	6.9 x 15.1	1.65

## TWO-STAGE MICROMODULES

TYPE	BASIC CHARACTERISTICS, $T_h=25\text{ }^\circ\text{C}$ , VACUUM ENVIRONMENT				DIMENSIONS, mm		
	$I_{\max}$ , A	$U_{\max}$ , V	$Q_{\max}$ , W	$\Delta T_{\max}$ , $^\circ\text{C}$	Cold side	Hot side	Height
2TM-29-10-0.4	0.4	3.6	0.42	98	4.8 x 4.8	6.4 x 6.4	4.7
2TM-29-10-0.5	0.5	3.6	0.52	98	4.8 x 4.8	6.4 x 6.4	4.0
2TM-29-10-0.6	0.6	3.6	0.60	98	4.8 x 4.8	6.4 x 6.4	4.2
2TM-29-10-0.9	0.9	3.6	0.77	98	4.8 x 4.8	6.4 x 6.4	3.3

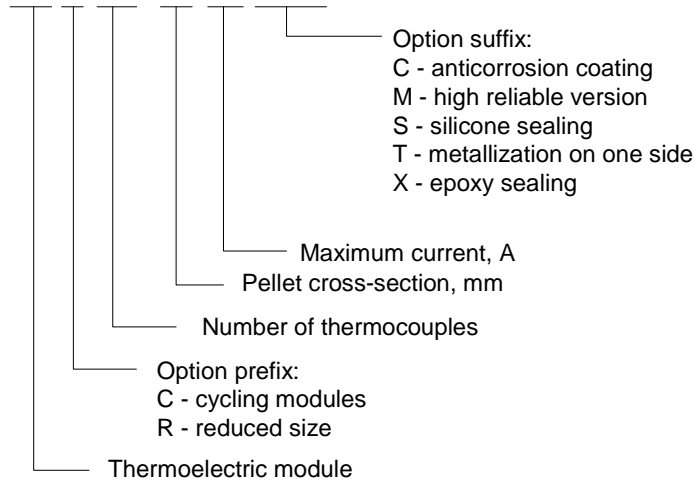
**DESIGNATIONS:**

- $I_{max}$  – Input current resulting in greatest  $\Delta T_{max}$ , (A)
- $U_{max}$  – Input Voltage at  $\Delta T_{max}$ , (V)
- $Q_{cmax}$  – Maximum heat pumping capacity at  $I_{max}$ ,  $\Delta T = 0$  K, (W)
- $\Delta T_{max}$  – Maximum temperature difference a module can achieve at  $I = I_{max}$  and  $Q_c = 0$ , (K)

**HOW TO DECODE PELTIER MODULE MARKING:**

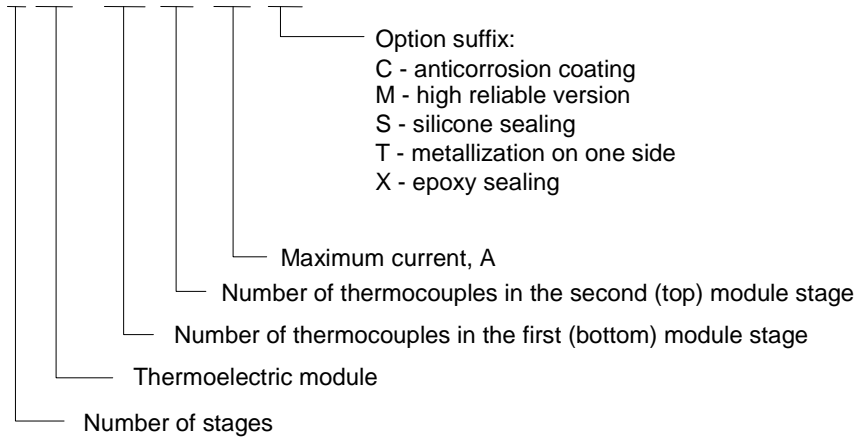
**One stage modules:**

TMC-127-1.4-6.0 MS



**Two stage modules:**

2TM-127-63-6.5 M



## POWER GENERATING MODULES

Module operating properties are given at hot side temperature 175°C and cold side temperature 50°C. Under these conditions maximum efficiency of electric power generation is around 3% for all presented modules.

Efficiency is determined as  $W_{load}/Q_{hot}$ , where  $W_{load}$  is an output power, Q is a heat flow through the module.

MODULE TYPE	Operating properties						DIMENSIONS, mm		
	$U_{oc}$ , V	$R_{in}$ , Ohm	$R_{load}$ , Ohm	$W_{load}$ , W	$U_{load}$ , V	$\Lambda_m$ , W/°C	Cold side	Hot side	Height
TMG-18-5.0-1.1	0.94	0.028	0.028	7.8	0.47	1.05	40 × 40	40 × 40	4.1
TMG-18-5.0-1.3	0.94	0.034	0.034	6.5	0.47	0.88	40 × 40	40 × 40	4.3
TMG-18-5.0-1.6	0.94	0.041	0.041	5.3	0.47	0.71	40 × 40	40 × 40	4.6
TMG-111-1.4-1.2 *	5.8	2.0	2.0	4.2	2.9	0.57	35 × 40	35 × 40	3.0
TMG-127-1.0-1.3	6.6	4.4	4.4	2.4	3.3	0.33	30 × 30	30 × 30	3.6
TMG-127-1.0-1.6	6.6	5.5	5.5	2.0	3.3	0.27	30 × 30	30 × 30	3.8
TMG-127-1.0-2.0	6.6	7.0	7.0	1.6	3.3	0.21	30 × 30	30 × 30	4.2
TMG-127-1.4-1.2	6.6	2.3	2.3	4.8	3.3	0.65	40 × 40	40 × 40	3.4
TMG-127-1.4-1.6	6.6	3.0	3.0	3.7	3.3	0.5	40 × 40	40 × 40	3.8
TMG-127-1.4-2.5	6.6	4.7	4.7	2.3	3.3	0.31	40 × 40	40 × 40	4.7
TMG-127-2.0-1.3	6.6	1.2	1.2	9.0	3.3	1.26	50 × 50	50 × 54	3.6
TMG-127-2.0-1.6	6.6	1.4	1.4	7.5	3.3	1.02	50 × 50	50 × 54	3.8
TMG-241-1.0-1.3	12.5	8.4	8.4	4.7	6.3	0.63	40 × 40	40 × 40	3.6
TMG-241-1.0-1.6	12.5	10.3	10.3	3.8	6.3	0.51	40 × 40	40 × 40	3.8
TMG-241-1.4-1.2	12.5	4.2	4.2	9.4	6.3	1.28	54.4 × 54.4	54.4 × 57	3.4
TMG-254-1.4-1.2	13.2	4.4	4.4	10.0	6.6	1.3	40 × 80	44 × 80	3.4
TMG-254-1.4-1.6	13.2	5.9	5.9	7.4	6.6	1.0	40 × 80	44 × 80	3.8
TMG-450-0.8-1.0	23.4	20.0	20.0	6.8	11.7	0.93	54.4 × 54.4	54.4 × 57.0	3.4

\* Module is assembled without top (hot) ceramic substrate (half skeleton).

### DESIGNATIONS:

$U_{oc}$  – open circuit voltage, (V)

$R_{in}$  – module internal resistance at 110°C, (Ohm)

$R_{load}$  – matched load resistance, (Ohm)

$U_{load}$  – output voltage, (V), corresponded to matched load

$\Lambda_m$  – module thermal conductance at 110°C, (W/°C)

### Notes:

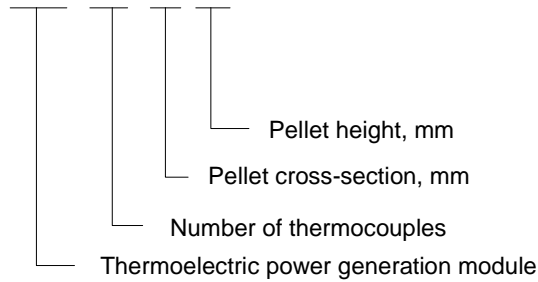
1. The open circuit voltage  $U_{oc}$  is the output voltage of the module without any load.
2. The match load is the module load when the load resistance  $R_{load}$  equals to the module's internal resistance  $R_{in}$ .
3. The output voltage and power will change with the load. Under match load the output power is at maximum under specified cold and hot side temperatures.



4. To get the best efficiency, the module should be mounted between flat and lapped faces and uniformly pressed with the force  $120\text{-}150\text{ N/cm}^2$  of module cold side surface.

#### HOW TO DECODE POWER GENERATING MODULE MARKING:

TMG-127-1.0-2.0



#### GENERAL TECHNICAL DATA AND OPTIONS

##### 1. Interior solders:

- Standard option – high temperature lead free solder with melting point temperature (MPT) higher  $227^{\circ}\text{C}$ : Sn-Cu (M.P.T $\geq 227^{\circ}\text{C}$ ), Sn-Cu-Ni (M.P.T= $227^{\circ}\text{C}$ ), Sn-Sb (M.P.T= $232\text{-}240^{\circ}\text{C}$ ),
- Special request - low temperature lead free solder Bi-Sn (M.P.T= $139^{\circ}\text{C}$ ).

##### 2. Outer ceramic surfaces can be

- Lapped
- Metalized
- Au plated
- Tinned by solders: In-Sn (M.P.T = $117^{\circ}\text{C}$ ), In-Ag (M.P.T= $143^{\circ}\text{C}$ ), Bi-Sn (M.P.T= $139^{\circ}\text{C}$ ).

##### 3. Lead wires:

- For standard modules – 18, 20, 22 or 24 AWG stranded tinned copper in PVC insulation, Teflon and Silicone insulation is available;
- For microcoolers – 30 AWG uninsulated solid wire.

4. All modules are assembled with multilayer antidiffusion barriers onto thermoelectric pellets.

5. Module height tolerance is  $\pm 0.2\text{ mm}$ ; height tolerance of  $0.02\text{ mm}$  is available on request.

6. Flatness and parallel variance not more than  $0.02\text{ mm}$ .

#### ADDITIONAL DATA

1. *Reliability tests of modules are available upon customer request.*
2. *All modules are assembled in accordance with RoHS requirements.*
3. *All modules are subjected to both thermal cycling influence test and ultrasonic diagnostics.*
4. *Thermal screening for control of temperature uniformity is provided upon request*

◆ SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.

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