Features

Regulated Converter

- OVC III and PD3 up to 5000m altitude
- 85-528VAC input range
- -40°C to +90°C operating temperature
- LPS limited power source
- EN55032 class “B”; floating outputs
- No load power consumption <0.3W

RECOM
AC/DC Converter

RAC15-K/480

15 Watt
2“ x 1.6“
Single Output

3 YEAR warranty

Description

The RAC15-K/480 series AC/DC modules with ultra-wide input range of 100-480 VAC are specially designed for harsh industrial conditions of overvoltage category OVC III and pollution degree PD3 in both single-phase and phase-to-phase power connections of class II. These power supplies are capable of operating over a wide temperature range of -40° to 90°C (up to 60°C without derating) by just adding an external fuse, and offer LPS limited outputs with continuous overcurrent protection and emission class B EMC compliance in potential free configuration of the load. These silicone-free encapsulated modules are built extremely compact to fit on printed circuit boards without compromising board area. Global safety certifications ensure fast time-to-market when integrated into applications for markets such as Smart Grid, Smart Metering, Renewable Energy; Sensors and actuators or IoT applications.

Selection Guide

Part Number	Input Voltage Range [VAC]	Output Voltage [VDC]	Output Current [mA]	Efficiency typ (1) [%]	Max. Capacitive Load (1) [µF]
RAC15-05SK/480	85-528	5	3000	86	20000
RAC15-12SK/480	85-528	12	1250	84	12000
RAC15-15SK/480	85-528	15	1000	85	10000
RAC15-24SK/480	85-528	24	625	87	6000

Notes:

Note1: Is tested at 230VAC input and constant resistive load at +25°C ambient

Model Numbering

RAC15-__ SK/480

- nom. Output Power
- Output Voltage
- **S**ingle

Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

BASIC CHARACTERISTICS					
Parameter	**Condition**		**Min.**	**Typ.**	**Max.**
Nominal Input Voltage (2)	50/60Hz		100VAC		277VAC
					480VAC
Input Voltage Range (3)	47-63HZ		85VAC		528VAC
	DC		120VDC		750VDC
Input Current	115/230VAC				500mA
	480VAC				400mA
Inrush Current	cold start	115VAC			20A
		230VAC			40A
		480VAC			50A

Notes:

Note2: 480VAC limited to L-L connections

Note3: The products were submitted for safety files at AC-Input operation

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IEC/EN62368-1 certified
UL62368-1 certified
CAN/CSA-C22.2 No. 62368-1-14 certified
IEC/EN61010 certified
IEC/EN60335-1 pending
EN62233 pending
EN55032 compliant
EN55035 compliant
CB Report

RAC15-K/480 Series

Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

BASIC CHARACTERISTICS

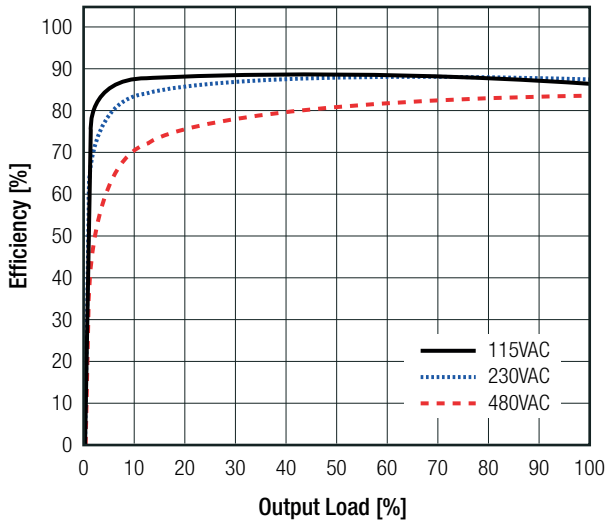
Parameter	Condition		Min.	Typ.	Max.
No Load Power Consumption	85-528VAC				300mW
Input Frequency Range	AC Input		47Hz		63Hz
Minimum Load			0%		
Power Factor	115/230VAC		0.4		
	480VAC		0.3		
Start-up Time				150ms	
Rise Time				30ms	
Hold-up Time	230VAC		30ms		
Internal Operating Frequency				50kHz	
Output Ripple and Noise (4)	20MHz BW	V_{OUT}= 5VDC			100mVp-p
		others			1% of V_{OUT}

Notes:

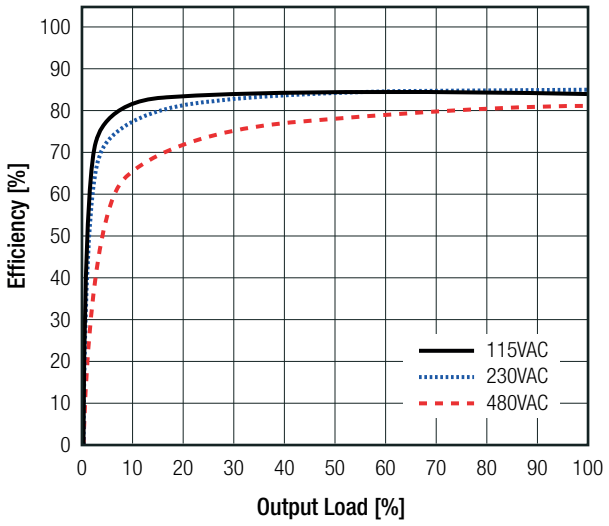
Note4: Measurements are made with a 0.1µF MLCC & 10µF E-cap in parallel across output (low ESR).

Efficiency vs. Load

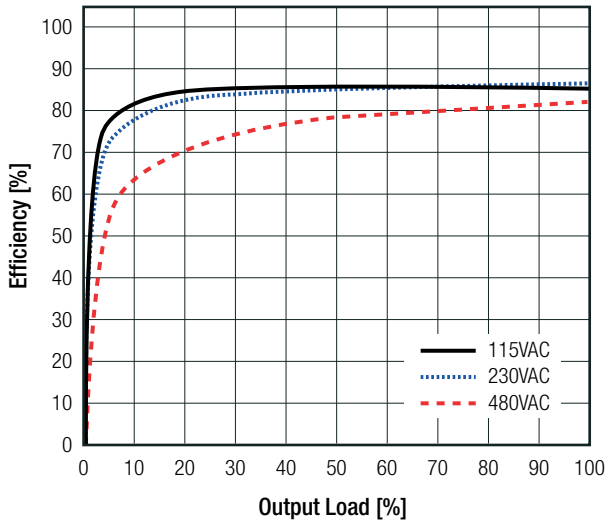
RAC15-05SK/480



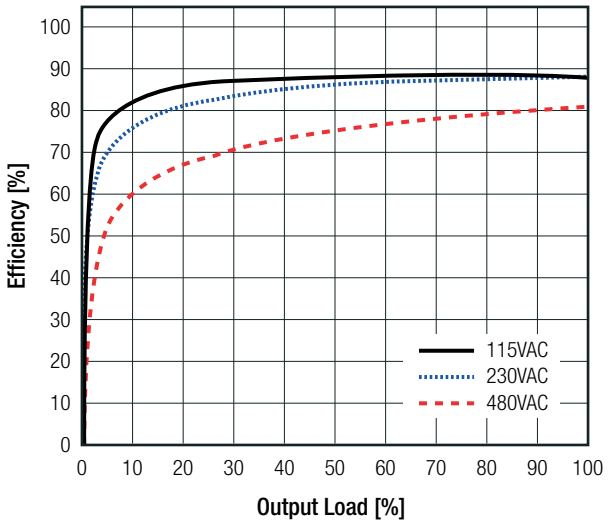
RAC15-12SK/480



RAC15-15SK/480



RAC15-24SK/480



Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

REGULATIONS

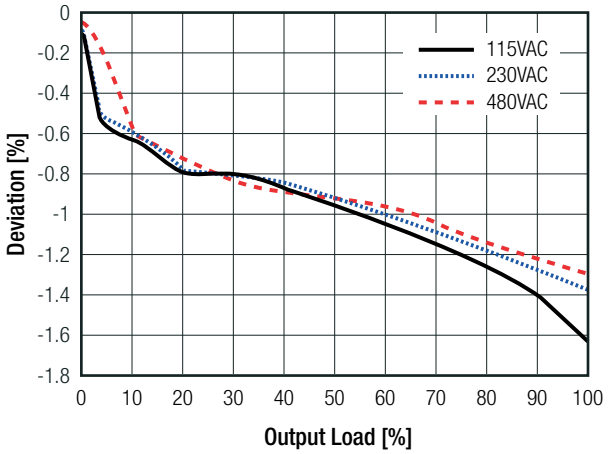
Parameter	Condition	Value
Output Accuracy		±3.0% max.
Line Regulation	low line to high line	±2.0% typ.
Load Regulation [5]	10% to 100% load	2.0% typ.
Transient Response	25% load step change	4.0% max.
	recovery time	1ms typ.

Notes:

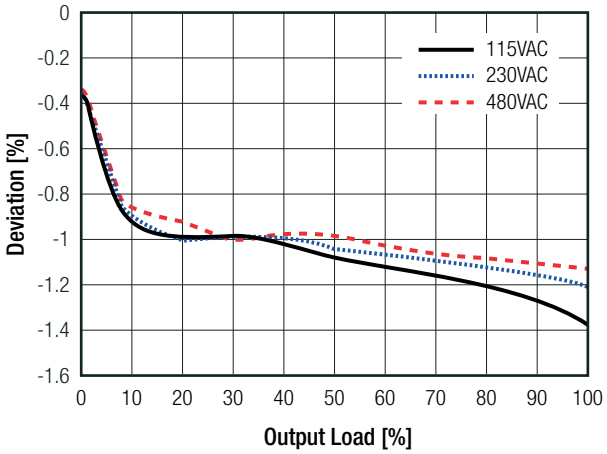
Note5: Operation below 10% load will not harm the converter, but specifications may not be met

Deviation vs. Load

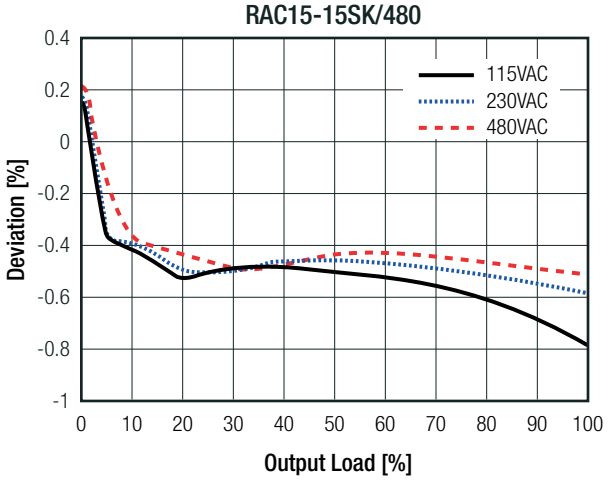
RAC15-05SK/480



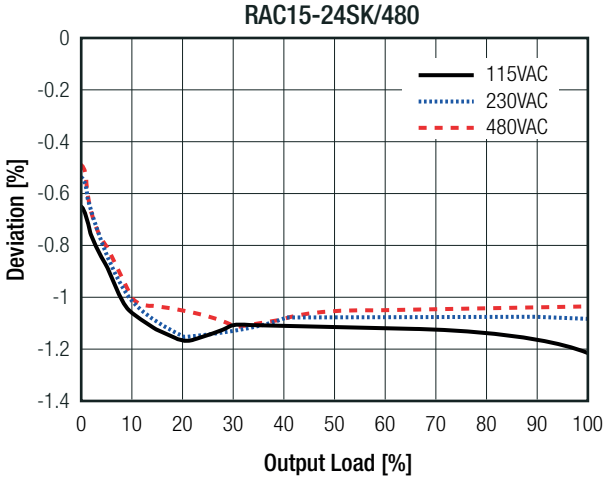
RAC15-12SK/480



RAC15-15SK/480



RAC15-24SK/480



PROTECTIONS

Parameter	Type	Value
Input Fuse	external (refer to ***"Protection Circuit"***)	T2A, 600VAC min.
Limited Power Source (LPS)	according to IEC62368-1 CB Report	yes
Short Circuit Protection (SCP)	below 100mΩ	hiccup, auto recovery
Over Voltage Protection (OVP)		105% - 120%, hiccup mode
Over Current Protection (OCP)		128% - 155%, hiccup mode
Over Voltage Category	according to 61010-1	OVCIII (up to 5000m)

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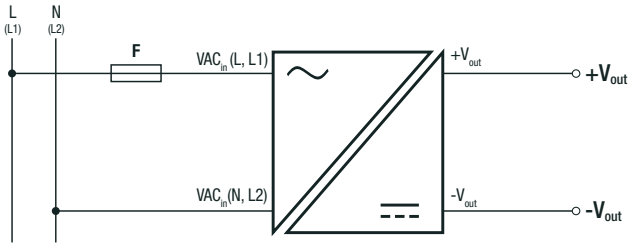
RAC15-K/480 Series

Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

Parameter	Type		Value
Isolation Voltage (6)	tested for 1 minute	I/P to O/P	3.6kVAC
	tested for 5 seconds		5.4kVAC
Isolation Resistance			1GΩ max.
Isolation Capacitance			200pF max.
Insulation Grade			reinforced
Leakage Current			200µA max.

Protection Circuit

An external fuse is mandatory in order to protect the device in addition on the AC input side. RECOM recommend: slow blow type, 600VAC, 2A



Notes:

Note6: For repeat Hi-Pot testing, reduce the time and/or the test voltage

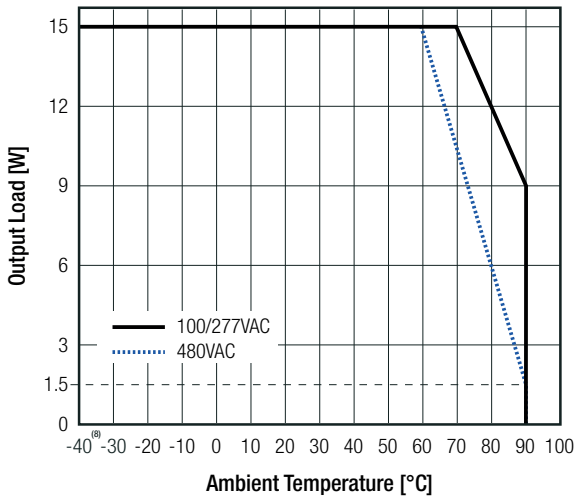
ENVIRONMENTAL

Parameter	Condition			Value
Operating Temperature Range (7)	refer to ***"Derating Graph (7)"***			-40°C to +90°C
Maximum Case Temperature				+105°C
Temperature Coefficient				0.02%/K
Operating Altitude				5000m
Operating Humidity	non-condensing			95% RH max.
Polution Degree				PD3
Vibration	according to MIL-STD-202G			10-500Hz, 2G 10min./1cycle, 60min. each along x,y,z axes
Design Lifetime	230VAC/50Hz	+50°C		30 x 10³ hours
MTBF	according to MIL-HDBK-217F, G.B.	V$_{OUT}$= 5, 12VDC	+25°C	1450 x 10³ hours
		V$_{OUT}$= 15, 24VDC		1720 x 10³ hours
		V$_{OUT}$= 5, 12VDC	+40°C	1310 x 10³ hours
		V$_{OUT}$= 15, 24VDC		1470 x 10³ hours

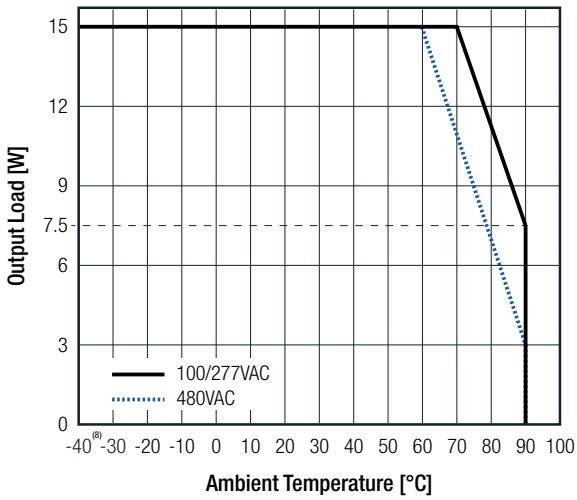
Derating Graph (7)

(@ Chamber and natural convection 0.1m/s)

RAC15-24SK/480



others



Notes:

Note7: Maximum load for coldstart at temperatures below -25°C should be limited to 12W

Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

SAFETY AND CERTIFICATIONS

Certificate Type (Safety)	Report Number	Standard
Audio/Video, information and communication technology equipment - Safety requirements	E491408-A6021-UL	UL62368-1, 3rd Edition, 2019 CAN/CSA C22.2 Nr. 62368-1-14, 3rd Ed. 2019
Audio/Video, information and communication technology equipment - Safety requirements (CB)	211112011	IEC62368-1:2014 2nd Edition
Audio/Video, information and communication technology equipment - Safety requirements (LVD)		EN62368-1:2014 + A11:2017
Audio/Video, information and communication technology equipment - Safety requirements (CB)	211112010	IEC62368-1:2018 3rd Edition
Audio/Video, information and communication technology equipment - Safety requirements		EN/IEC62368-1:2020 + A11:2020
Electrical Equipment For Measurement, Control, and Laboratory Use; Part 1: General Requirements	085-210569501-000	IEC61010-1:2010 3rd Edition + A1:2016
Electrical Equipment For Measurement, Control, and Laboratory Use; Part 1: General Requirements	64.210.21.05695.01	EN61010-1:2010 + A1:2019
Household and similar electrical appliances – Safety – Part 1: General requirements	pending	IEC60335-1:2010 EN60335-1:2012
Measurement methods for electromagnetic fields of household appliances and similar apparatus with regard to human exposure	pending	EN62233:2008
EAC		TP TC 004/2011
RoHS2		RoHS-2011/65/EU + AM-2015/863

EMC Compliance (EN55032) [8]	Condition	Standard / Criterion
Electromagnetic compatibility of multimedia equipment - Emission requirements		EN55032:2015 + A11:2020, Class B
Electromagnetic compatibility of multimedia equipment – Immunity requirements		EN55035:2017 + A11:2020
ESD Electrostatic discharge immunity test	Air: ±2, 4, 8kV Contact: ±2, 4kV	EN61000-4-2:2009, Criteria A
Radiated, radio-frequency, electromagnetic field immunity test	3 V/m (80-5000MHz)	EN61000-4-3:2006 + A2:2010, Criteria A
Fast Transient and Burst Immunity	AC Port: L, N, L-N ±1kV	EN61000-4-4:2012, Criteria A
Surge Immunity	AC Port: L-N: ±1kV	EN61000-4-5:2015, Criteria A
Immunity to conducted disturbances, induced by radio-frequency fields	AC Port: 3Vrms (0.15-10MHz) 3-1Vrms (10-30MHz) 1Vrms (30-80MHz)	EN61000-4-6:2014, Criteria A
Power Magnetic Field Immunity	1A/m	EN61000-4-8:2010, Criteria A
Voltage Dips	100% (0.5P, 0.5P) 30% (25P, 30P)	EN61000-4-11:2004, Criteria A EN61000-4-11:2004, Criteria A
Voltage Interruptions	100% (250P/300P)	EN61000-4-11:2004, Criteria B

EMC Compliance (EN61204-3) [8]	Condition	Standard / Criterion
Low voltage power supplies, d.c. output Part 3: Electromagnetic compatibility (EMC)		EN IEC 61204-3:2018
ESD Electrostatic discharge immunity test	Air: ±2, 4, 8kV Contact: ±4kV	EN61000-4-2:2009, Criteria A
Radiated, radio-frequency, electromagnetic field immunity test	10V/m (80-1000MHz) 3V/m (1400-2000MHz) 1V/m (2000-2700MHz)	EN61000-4-3:2006 + A2:2010, Criteria A
Fast Transient and Burst Immunity	AC Port: L, N, L-N ±2kV	EN61000-4-4:2012, Criteria A
Surge Immunity	AC Port: L-N: ±1kV	EN61000-4-5:2014 + A1:2017, Criteria A
Immunity to conducted disturbances, induced by radio-frequency fields	AC Port: 10Vrms (0.15-80MHz)	EN61000-4-6:2014, Criteria A
Power Magnetic Field Immunity	30A/m	EN61000-4-8:2010, Criteria A
Voltage Dips	100% (0.5P, 0.5P) 100% (1.0P, 1.0P) 60% (10P, 12P) 30% (25P, 30P) 20% (250P, 300P)	EN61000-4-11:2004 + A1:2017, Criteria A

Notes:

Note8: With earth referenced output connections, use of an external common mode choke 45mH (E-type) may be considered at the input.

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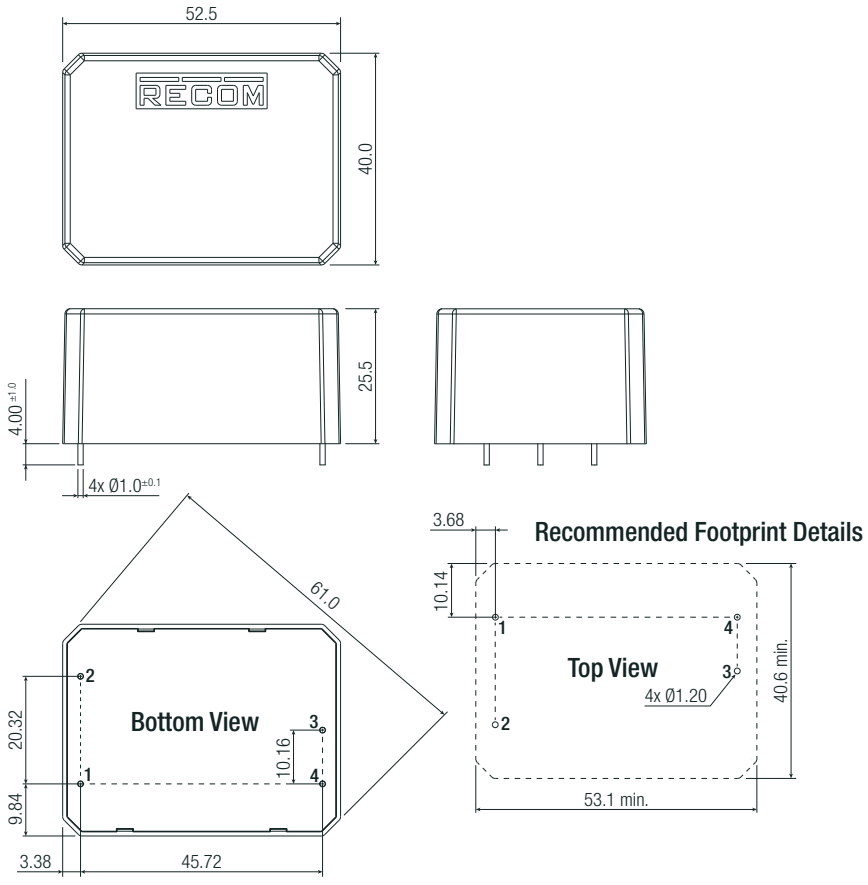
Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

EMC Compliance (EN61204-3) [8]	Condition	Standard / Criterion
Voltage Interruptions	100% (250P, 300P)	EN61000-4-11:2004 + A1:2017, Criteria B
Limits of Harmonic Current Emissions		EN IEC 61000-3-2:2019
Limits of Harmonic Current Emissions		EN61000-3-2:2014
Limits of Voltage Fluctuations & Flicker		EN61000-3-3:2013 + A1:2019

DIMENSION AND PHYSICAL CHARACTERISTICS

Parameter	Type	Value
Material	case/baseplate	polycarbonate, (UL94V-0)
	potting	PU, (UL94V-0)
	PCB	FR4, (UL94V-0)
Dimension (LxWxH)		52.5 x 40.0 x 25.5mm
Weight		92g typ.

Dimension Drawing (mm)



Pinning information

Pin #	Single
1	VAC in (N) (L2)
2	VAC in (L) (L1)
3	-Vout
4	+Vout

Tolerance: xx.x= ±0.5mm
xx.xx= ±0.25mm

PACKAGING INFORMATION

Parameter	Type	Value
Packaging Dimension (LxWxH)	tube	56.0 x 40.0 x 490.0mm
Packaging Quantity		11pcs
Storage Temperature Range		-40°C to +90°C
Storage Humidity	non-condensing	95%