




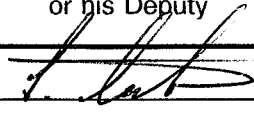
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**CAPACITORS, FIXED CERAMIC DIELECTRIC,  
TYPE II,  
BASED ON TYPE TCN83E  
ESA/SCC Detail Specification No. 3001/027**



**space components  
coordination group**

Issue/Rev.	Date	Approved by	
		SCCG Chairman	ESA Director General or his Deputy
Issue 1	April 1994		



**SCC**

ESA/SCC Detail Specification  
No. 3001/027

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ISSUE 1

**DOCUMENTATION CHANGE NOTICE**

Rev. Letter	Rev. Date	Reference	CHANGE Item	Approved DCR No.

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**1. GENERAL****1.1 SCOPE**

This specification details the ratings, physical and electrical characteristics, test and inspection data for Capacitors, Fixed, Ceramic Dielectric, Type II, based on Type TCN83E. It shall be read in conjunction with ESA/SCC Generic Specification No. 3001, the requirements of which are supplemented herein.

**1.2 RANGE OF COMPONENTS**

The range of capacitors covered by this specification is given in Table 1(a).

**1.3 MAXIMUM RATINGS**

The maximum ratings, which shall not be exceeded at any time during use or storage, applicable to the capacitors specified herein are scheduled in Table 1(b).

**1.4 PARAMETER DERATING INFORMATION (FIGURE 1)**

Not applicable.

**1.5 PHYSICAL DIMENSIONS**

The physical dimensions of the capacitors specified herein are shown in Figure 2.

**1.6 FUNCTIONAL DIAGRAM**

The functional diagram for the capacitors specified herein is shown in Figure 3.

**TABLE 1(a) - RANGE OF COMPONENTS**

Capacitance Value ( $\mu\text{F}$ )	Capacitance Tolerance ( $\pm\%$ )	Rated Voltage ( $U_R$ ) (Vdc)	Case Size	Weight (g)
5.6	10	50	A	10
6.8	10, 20	50	A	10
8.2	10	50	A	10
10	10, 20	50	A	10
12	10	50	A	10
15	10, 20	50	A	10
18	10	50	B	12
22	10, 20	50	B	12
27	10	50	C	18
33	10, 20	50	C	18
39	10	50	D	35
47	10, 20	50	D	35
1.8	10	100	A	10
2.2	10, 20	100	A	10
2.7	10	100	A	10
3.3	10, 20	100	A	10
3.9	10	100	A	10
4.7	10, 20	100	A	10
5.6	10	100	B	12
6.8	10, 20	100	B	12
8.2	10	100	B	12
10	10, 20	100	C	18
12	10	100	C	18
15	10, 20	100	C	18
18	10	100	D	35
22	10, 20	100	D	35
27	10	100	E	50
33	10, 20	100	E	50
1.0	10, 20	250	A	10
1.2	10	250	A	10
1.5	10, 20	250	A	10
1.8	10	250	B	12
2.2	10, 20	250	B	12
2.7	10	250	C	18
3.3	10, 20	250	C	18
3.9	10	250	D	35
4.7	10, 20	250	D	35
5.6	10	250	D	35
6.8	10, 20	250	D	35

**TABLE 1(a) - RANGE OF COMPONENTS (CONT'D)**

Capacitance Value ( $\mu\text{F}$ )	Capacitance Tolerance ( $\pm\%$ )	Rated Voltage ( $U_R$ ) (V)	Case Size	Weight (g)
8.2	10	250	E	50
10	10, 20	250	E	50
1.0	10, 20	400	A	10
1.2	10	400	B	12
1.5	10, 20	400	B	12
1.8	10	400	C	18
2.2	10, 20	400	C	18
2.7	10	400	D	35
3.3	10, 20	400	D	35
3.9	10	400	D	35
4.7	10, 20	400	E	50
5.6	10	400	E	50
6.8	10, 20	400	E	50

**TABLE 1(b) - MAXIMUM RATINGS**

No.	Characteristics	Symbol	Limits		Unit	Remarks
			Min.	Max.		
1	Rated Voltage	$U_R$	-	50 100 250 400	Vdc	Range (See Table 1(a))
2	Temperature Characteristic	$\frac{\Delta C}{C}$	See Table 3		%	$V_T = 0$ $V_T = U_R$
3	Operating Temperature Range	$T_{amb}$	-55	+125	$^{\circ}\text{C}$	Without derating. $T_{amb}$
4	Storage Temperature Range	$T_{stg}$	-55	+125	$^{\circ}\text{C}$	
5	Soldering Temperature	$T_{sol}$	-	+260	$^{\circ}\text{C}$	Note 1

**NOTES**

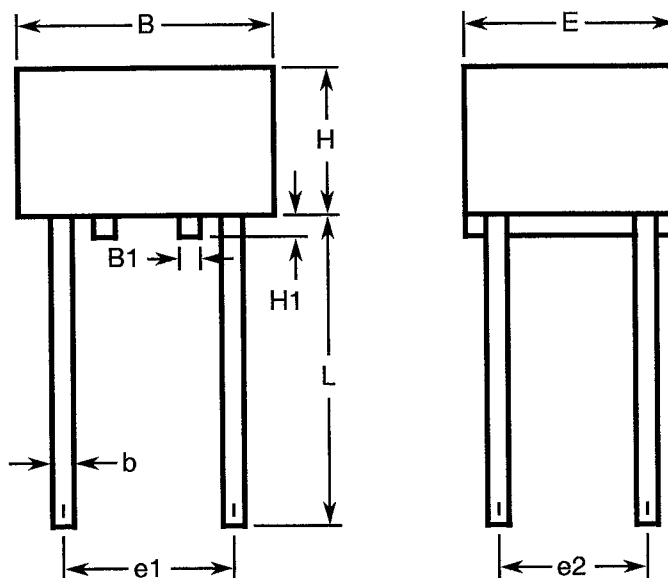
- Duration 5 seconds maximum at a distance of not less than 1.5mm from the case and the same lead shall not be resoldered until 3 minutes have elapsed.

**FIGURE 1 - PARAMETER DERATING INFORMATION**

Not applicable.



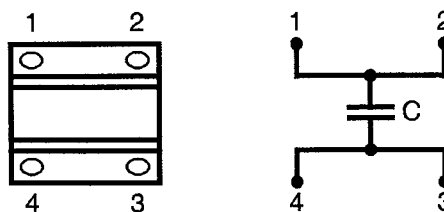
**FIGURE 2 - PHYSICAL DIMENSIONS**



SYMBOL	MILLIMETRES	
	MIN	MAX
b	0.95	1.10
B	21.50	22.50
B1	1.00	3.00
e1	17.30	18.30
e2	9.66	10.66
E	18.50	19.50
H1	0.20	0.60
L	30.00	-

CASE SIZE	MILLIMETRES
	H MAX
A	6.5
B	8.0
C	12.5
D	20.0
E	30.0

**FIGURE 3 - FUNCTIONAL DIAGRAM**



**NOTES**

1. These capacitors have 4 outputs connected 2 by 2.



**2. APPLICABLE DOCUMENTS**

The following documents for part of this specification and shall be read in conjunction with it:-

- (a) ESA/SCC Generic Specification No. 3001 for Capacitors, Fixed, Ceramic Dielectric, Types I and II.

**3. TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS**

For the purpose of this specification, the terms, definitions, abbreviations, symbols and units specified in ESA/SCC Basic Specification No. 21300 shall apply. In addition the following symbol is used:-

$V_T$  = Test Voltage.

**4. REQUIREMENTS****4.1 GENERAL**

The complete requirements for procurement of the capacitors specified herein are stated in this specification and ESA/SCC Generic Specification No. 3001 for Capacitors, Fixed, Chips, Ceramic Dielectric, Types I and II. Deviations from the Generic Specification, applicable to this specification only, are listed in Para. 4.2.

Deviations from the applicable Generic Specification and this Detail Specification, formally agreed with specific Manufacturers on the basis that the alternative requirements are equivalent to the ESA/SCC requirements and do not affect the components' reliability, are listed in the appendices attached to this specification.

**4.2 DEVIATIONS FROM GENERIC SPECIFICATION****4.2.1 Deviations from Special In-process Controls**

None.

**4.2.2 Deviations from Final Production Tests (Chart II)**

- (a) Para. 9.5.1.4.1(b), Voltage Proof - Body Insulation: Not applicable.

**4.2.3 Deviations from Burn-in Tests (Chart III)**

- (a) Para. 9.5.1.4.1(b), Voltage Proof - Body Insulation: Not applicable.

**4.2.4 Deviations from Qualification Tests (Chart IV)**

- (a) Para. 9.5.1.4.1(b), Voltage Proof - Body Insulation: Not applicable.

**4.2.5 Deviations from Lot Acceptance Tests (Chart V)**

- (a) Para. 9.5.1.4.1(b), Voltage Proof - Body Insulation: Not applicable.

**4.3 MECHANICAL REQUIREMENTS****4.3.1 Dimension Check**

The dimensions of the capacitors specified herein shall be verified in accordance with the requirements set out in Para. 9.4 of ESA/SCC Generic Specification No. 3001 and they shall conform to those shown in Figure 2 of this specification.



#### 4.3.2 Weight

The maximum weight of the capacitors specified herein shall be as scheduled in Table 1(a).

#### 4.3.3 Robustness of Terminations

The requirements for robustness of terminations are specified in Para. 9.7 of ESA/SCC Generic Specification No. 3001. The test conditions shall be as follows:-

- (a) **Applied Force:** 20N, tensile; 10N, bending.
- (b) **Duration:** 10s.

For the tensile test, the force shall be applied gradually to the terminal and then maintained for a period of 5 to 10 seconds. After each of these tests, the capacitors shall be examined for evidence of breaking and loosening of terminals.

For the bending test, Method 1 shall be applied.

Tests  $U_C$  (Torsion) and  $U_A$  (Torque) are not applied.

#### 4.4 MATERIALS AND FINISHES

The materials and finishes shall be as specified herein. Where a definite material is not specified, a material which will enable the capacitors specified herein to meet the performance requirements of this specification shall be used. Acceptance or approval of any constituent material does not guarantee acceptance of the finished product.

##### 4.4.1 Case

As a minimum, a thermo-setting resin moulding shall ensure the protection of the capacitors.

##### 4.4.2 Leads

The lead material shall be Type 'A' with Type '3 or 4' finish in accordance with the requirements of ESA/SCC Basic Specification No. 23500.

#### 4.5 MARKING

##### 4.5.1 General

The marking of components delivered to this specification shall be in accordance with the requirements of ESA/SCC Basic Specification No. 21700 and the following paragraphs. When the component is too small to accommodate all of the marking specified, as much as space permits shall be marked and the marking information, in full, shall accompany the component in its primary package.

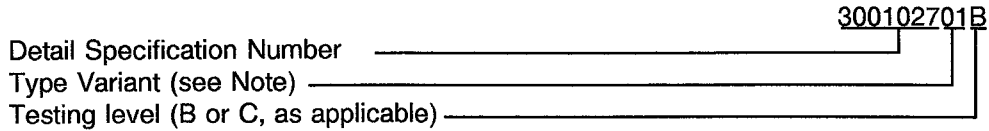
The information to be marked and the order of precedence, shall be as follows:-

- (a) The SCC Component Number.
- (b) Electrical Characteristics and Ratings.
- (c) Traceability Information.



4.5.2 The SCC Component Number

The SCC Component Number shall be constituted and marked as follows:-



**N.B.**

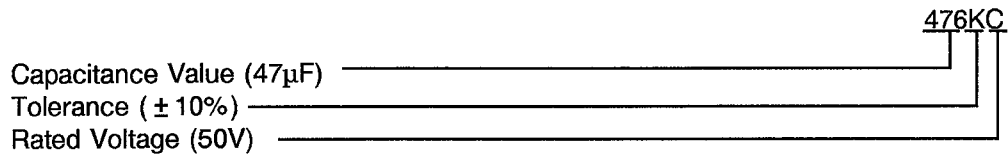
Marking of the Type Variant Number is mandatory. No further reference to type variants is made in this specification.

4.5.3 Electrical Characteristics and Ratings

The electrical characteristics and ratings to be marked in the following order of precedence are:-

- (a) Capacitance Value.
- (b) Tolerance.
- (d) Rated Voltage.

The information shall be constituted and marked as follows:-



4.5.3.1 Capacitance Values

The capacitance values shall be expressed by means of the following codes. The unit quantity for marking shall be picofarads.

Capacitance Value	Code
XX10 <sup>5</sup>	XX5
XX10 <sup>6</sup>	XX6
XX10 <sup>7</sup>	XX7
XX10 <sup>8</sup>	XX8

4.5.3.2 Tolerances

The tolerances on capacitance values shall be indicated by the code letters specified hereafter.

Tolerance (%)	Code Letter
± 10	K
± 20	M



#### 4.5.3.3 Rated Voltage

The rated voltage shall be indicated by the code letters specified hereafter.

Rated Voltage ( $U_R$ )	Code Letter
50	C
100	E
250	H
400	K

#### 4.5.4 Traceability Information

Traceability information shall be marked in accordance with the requirements of ESA/SCC Basic Specification No. 21700.

- (a) Manufacturing Date Code.
- (b) Serial Number.
- (c) Manufacturer's Name.

#### 4.6 ELECTRICAL MEASUREMENTS

##### 4.6.1 Electrical Measurements at Room Temperature

The parameters to be measured at room temperature are scheduled in Table 2. Unless otherwise specified, measurements shall be performed at  $T_{amb} = +22 \pm 3$  °C.

##### 4.6.2 Electrical Measurements at High and Low Temperatures

The parameters to be measured at high and low temperatures are scheduled in Table 3. The measurements shall be performed at  $T_{amb} = +125(+0-5)$  and  $-55(+5-0)$  °C.

##### 4.6.3 Circuits for Electrical Measurements

A circuit for use in performing the electrical measurements listed in Table 2 of this specification is shown in ESA/SCC Generic Specification No. 3001.

#### 4.7 BURN-IN TESTS

##### 4.7.1 Parameter Drift Values

The parameter drift values applicable to burn-in are specified in Table 4 of this specification. Unless otherwise stated, measurements shall be performed at  $T_{amb} = +22 \pm 3$  °C. The parameter drift values ( $\Delta$ ) applicable to the parameters scheduled shall not be exceeded. In addition to these drift value requirements for a given parameter, the appropriate limit value specified in Table 2 shall not be exceeded.

##### 4.7.2 Conditions for Burn-in

The requirements for burn-in are specified in Section 7 of ESA/SCC Generic Specification No. 3001. The conditions for burn-in shall be as specified in Table 5 of this specification.

On completion of burn-in, a recovery period of  $24 \pm 2$  hours is necessary before performance of the end-measurements.

##### 4.7.3 Electrical Circuit for Burn-in (Figure 5)

Not applicable.



**TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE**

No.	Characteristics	Symbol	ESA/SCC 3001 Test Conditions	Limits		Unit
				Min	Max	
1	Capacitance	C	Para. 9.5.1.1	See Table 1(a)		μF
2	Tangent of Loss Angle	tgδ	Para. 9.5.1.2	-	250	10 <sup>-4</sup>
3	Insulation Resistance	Ri × C	Para. 9.5.1.3	1000	-	sec
4	Voltage Proof - Dielectric	VP	Para. 9.5.1.4	2.5UR	-	Vdc

**TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES**

No.	Characteristics	Symbol	ESA/SCC 3001 Test Conditions	Limits		Unit	Remarks
				Min	Max		
3	Insulation Resistance at T <sub>amb</sub> = +125 ± 3 °C	Ri × C	Para. 9.5.1.3	100	-	sec	Note 1
6	Temperature Characteristic	$\frac{\Delta C}{C}$	Para. 9.17, V <sub>T</sub> = 0	- 20	20	%	Note 2
6	Temperature Characteristic	$\frac{\Delta C}{C}$	Para. 9.17, V <sub>T</sub> = U <sub>R</sub> For U <sub>R</sub> = 50V 100V 250V 400V	- 30 - 30 - 40 - 50	20 20 20 20	%	Notes 2 and 3

**NOTES**

1. Applicable to Level 'B' only. Sample test: Inspection Level S3, AQL 2.5%.
2. Sample test: 5 pieces from each dielectric lot. If 1 failure occurs, the complete lot shall be checked.
3. See Appendix 'A'.

**FIGURE 4 - CIRCUITS FOR ELECTRICAL MEASUREMENTS**

Not applicable.

**TABLE 4 - PARAMETER DRIFT VALUES**

No.	Characteristics	Symbol	Spec. and/or Test Method	Test Conditions	Change Limits ( $\Delta$ )	Unit
1	Capacitance Change	$\frac{\Delta C}{C}$	As per Table 2	As per Table 2	$\pm 10$	%

**TABLE 5 - CONDITIONS FOR BURN-IN AND OPERATING LIFE TESTS**

No.	Characteristic	Symbol	Condition	Unit
1	Ambient Temperature	$T_{amb}$	$+ 125(+ 0 - 5)$	$^{\circ}C$
2	Test Voltage	$V_T$	$2.0U_R$	V

**FIGURE 5 - ELECTRICAL CIRCUIT FOR BURN-IN AND OPERATING LIFE TESTS**

Not applicable.



- 4.8 ENVIRONMENTAL AND ENDURANCE TESTS (CHARTS IV AND V OF ESA/SCC GENERIC SPECIFICATION NO. 3001)
- 4.8.1 Measurements and Inspections on Completion of Environmental Tests  
The parameters to be measured and inspections to be performed on completion of environmental tests are scheduled in Table 6. Unless otherwise specified, the measurements shall be performed at  $T_{amb} = +22 \pm 3 \text{ }^\circ\text{C}$ .
- 4.8.2 Measurements and Inspections at Intermediate Points during Endurance Tests  
The parameters to be measured and inspections to be performed at intermediate points during endurance tests are scheduled in Table 6. Unless otherwise specified, the measurements shall be performed at  $T_{amb} = +22 \pm 3 \text{ }^\circ\text{C}$ .
- 4.8.3 Measurements and Inspections on Completion of Endurance Tests  
The parameters to be measured and inspections to be performed on completion of endurance tests are scheduled in Table 6. Unless otherwise specified, the measurements shall be performed at  $T_{amb} = +22 \pm 3 \text{ }^\circ\text{C}$ .
- 4.8.4 Conditions for Operating Life Tests (Part of Endurance Testing)  
The requirements for operating life testing are specified in Section 9 of ESA/SCC Generic Specification No. 3001. The conditions for operating life testing shall be as specified in Table 5 for the Burn-in test
- 4.8.5 Electrical Circuit for Operating Life Tests (Figure 5)  
Not applicable.



**TABLE 6 - MEASUREMENTS AND INSPECTIONS ON COMPLETION OF ENVIRONMENTAL TESTS AND AT INTERMEDIATE POINTS AND ON COMPLETION OF ENDURANCE TESTING**

NO.	ESA/SCC GENERIC SPEC.NO. 3001		MEASUREMENTS AND INSPECTIONS		SYMBOL	LIMITS		UNIT
	ENVIRONMENTAL AND ENDURANCE TESTS (1)	TEST METHOD AND CONDITIONS	IDENTIFICATION	CONDITIONS		MIN.	MAX.	
01	Robustness of Terminations	Para. 9.7 and Para. 4.3.3 of this specification	Visual Examination	-	-			
02	Resistance to Soldering Heat	Para. 9.8	<b>Initial Measurements</b> Capacitance	Table 2 Item 1	C	Table 2 Item 1		μF
			<b>Final Measurements</b> Capacitance Change Insulation Resistance	After a recovery period of 24 ± 2 hours Table 2 Item 1 Table 2 Item 3	ΔC/C Ri × C	- 10	20	% sec
03	Solderability	Para. 9.9	Visual Examination	-	-			
04	Rapid Change of Temperature	Para. 9.10	<b>Initial Measurements</b> Capacitance	Table 2 Item 1	C	Table 2 Item 1		μF
			<b>Final Measurements</b> Visual Examination Capacitance Change Tangent of Loss Angle	After a recovery period of 24 ± 2 hours - Table 2 Item 1 Table 2 Item 2	- ΔC/C tgδ	- 10	10	% 10 <sup>-4</sup>
05	Vibration	Para. 9.11	<b>During Last Cycle</b> Intermittent Contact	Open or Shorts	-			
			<b>After Test</b> Visual Examination	-	-			
06	Shock or Bump	Para. 9.12	Visual Examination	-	-			
07	Climatic Sequence	Para. 9.13	<b>Initial Measurements</b> Capacitance	Table 2 Item 1	C	Table 2 Item 1		μF
			<b>Final Measurements</b> External Visual Inspection Capacitance Change Tangent of Loss Angle Insulation Resistance	After a recovery period of 24 ± 2 hours Para. 9.3 of ESA/SCC3001 Table 2 Item 1 Table 2 Item 2 Table 2 Item 3	- ΔC/C tgδ Ri × C	- 10	10	% 10 <sup>-4</sup> sec

**NOTES**

1. The tests in this Table refer to either Chart IV or V and shall be used as applicable.





**TABLE 6 - MEASUREMENTS AND INSPECTIONS ON COMPLETION OF ENVIRONMENTAL TESTS AND AT INTERMEDIATE POINTS AND ON COMPLETION OF ENDURANCE TESTING (CONT'D)**

NO.	ESA/SCC GENERIC SPEC.NO. 3001		MEASUREMENTS AND INSPECTIONS		SYMBOL	LIMITS		UNIT
	ENVIRONMENTAL AND ENDURANCE TESTS (1)	TEST METHOD AND CONDITIONS	IDENTIFICATION	CONDITIONS		MIN.	MAX.	
08	Damp Heat, Steady State	Para. 9.14 Half of components with $U_R$ applied, half of components without $U_R$ applied. During 56 days at $40 \pm 2^\circ\text{C}$ and 93 (+2-0)% relative humidity	<b>Initial Measurements</b>	Table 2 Item 1	C	Table 2 Item 1		$\mu\text{F}$
			Capacitance					
			<b>Final Measurements</b>	After a recovery period of $24 \pm 2$ hours				
			Visual Examination	-				
			Capacitance Change	Table 2 Item 1	$\Delta\text{C/C}$	- 10	10	%
			Tangent of Loss Angle	Table 2 Item 2	$\text{tg}\delta$	Table 2 Item 2		$10^{-4}$
			Insulation Resistance	Table 2 Item 3	$\text{Ri} \times \text{C}$	50	-	sec
09	Operating Life	Para. 9.15 - Temp. during test: $+125^\circ\text{C}$ - Applied voltage: $2.0U_R$ Change limits relate to initial (0- hour) measurements	<b>Initial Measurements</b>	Table 2 Item 1	C	Table 2 Item 1		$\mu\text{F}$
			Capacitance					
			<b>Intermediate and Final Measurements</b>	Table 2 Item 1	$\Delta\text{C/C}$	- 15	15	%
			Capacitance Change					
			Tangent of Loss Angle	Table 2 Item 2	$\text{tg}\delta$	Table 2 Item 2		$10^{-4}$
			Insulation Resistance	Table 2 Item 3	$\text{Ri} \times \text{C}$	250	-	sec
	After 1000 hrs		100	-	sec			
	After 2000 hrs		Table 2 Item 4		Vdc			
	Voltage Proof	Table 2 Item 4	VP					
10	Temperature Characteristic	Para. 9.17	Temperature Characteristic	Table 3 Item 6	$\Delta\text{C/C}$	Table 3 Item 6		%

**NOTES**

1. The tests in this Table refer to either Chart IV or V and shall be used as applicable.

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**APPENDIX 'A'**

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**AGREED DEVIATIONS FOR EUROFARAD (F)**

The measurement of Temperature Characteristic in Table 3 may be performed as follows:

No.	Characteristics	Symbol	ESA/SCC 3001 Test Conditions	Limits		Unit
				Min	Max	
6	Temperature Characteristic	$\frac{\Delta C}{C}$	Para. 9.17 For: $U_R = 50V, V_T = 50V$ $U_R = 100V, V_T = 100V$ $U_R = 250V, V_T = 200V$ $U_R = 400V, V_T = 200V$	- 30 - 30 - 35 - 30	20 20 20 20	%