

**Superflux787 X H-12K**  
**H-14**  
**M-12K**  
**Ni-5**  
**Ni1-K**  
**Ni-2G**  
**F-3**

SUBMERGED ARC WELDING CONSUMABLES  
FOR WELDING OF MILD & HIGH TENSILE STEEL

2021.03

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**HYUNDAI WELDING CO., LTD.**



## ❖ Specification

Flux	JIS Z 3352	EN ISO 14174	KS B ISO 14174
Superflux787	S A FB 1	S A FB 1	S A FB 1
Wire	AWS A5.17/A5.23		EN ISO 14171
H-12K	A5.17 F7A(P)8-EH12K		S3Si
H-14	A5.17 F7A(P)8-EH14		S4
M-12K	A5.17 F6A(P)6-EM12K		S2Si
Ni-5	A5.23 F8A(P)8-ENi5-Ni1		S3Ni1Mo0.2
Ni1-K	A5.23 F8A(P)6-ENi1K-Ni1		SZ2Ni1
Ni-2G	A5.23 F8A8-ENi2-G		S2Ni2
F-3	A5.23 F9A(P)8-EF3-F3		S3Ni1Mo

## ❖ Applications

Single and multi-layer welding of various kinds of structure such as ship buildings, offshore structures, machinery and pressure vessels.

## ❖ Characteristics on Usage

High-basic bonded type flux having High Tensile strength and good impact value at low temperature. Because of insensitivity to rust, scale, primer on the surface to be welded, it has excellent X-ray characteristics and slag removal.

## ❖ Note on Usage

1. Dry the flux at 300~350°C (572~662°F) for 60minutes before use.
2. When the flux height is excessive, poor bead appearance may occur.
3. Remove rust, scales, oil, paint, water, dirt and slag of tack welds from the groove to obtain sound weld metal.



## Welding Consumables for Test

### ❖ Flux

Consumable	Chemical Composition, wt%		
	MgO+MnO	CaF <sub>2</sub> +CaO	Al <sub>2</sub> O <sub>3</sub> +SiO <sub>2</sub>
Superflux787	35	35	30

Consumable	Particle size(mesh)	Type of Flux	Basicity index	H <sub>2</sub> O(1000℃)/CO <sub>2</sub> (%)
Superflux787	10 × 48	Agglomerated	2.7	0.05/0.50

### ❖ Electrode

Consumables	Dia. mm (in)	Chemical Composition, wt%						
		C	Si	Mn	P	S	Ni	Mo
H-12K	4.0(5/32)	0.10	0.30	1.73	0.016	0.009	-	-
AWS A5.17 EH12K		0.06-0.15	0.20-0.65	1.50-2.00	≤0.025	≤0.025	-	-
H-14	4.0(5/32)	0.12	0.03	1.93	0.016	0.009	-	-
AWS A5.17 EH14		0.10-0.20	≤0.10	1.70-2.20	≤0.030	≤0.030	-	-
M-12K	4.0(5/32)	0.09	0.20	1.12	0.012	0.008	-	-
AWS A5.17 EM12K		0.05-0.15	0.10-0.35	0.80-1.25	≤0.030	≤0.030	-	-
Ni-5	4.0(5/32)	0.10	0.24	1.45	0.005	0.001	0.90	0.25
AWS A5.23 ENi5		≤0.12	0.05-0.30	1.20-1.60	≤0.020	≤0.020	0.75-1.25	0.10-0.30
EN ISO 14171 A S3Ni1Mo0.2		0.07-0.15	0.10-0.35	1.20-1.60	≤0.015	≤0.015	0.80-1.20	0.15-0.30
Ni1-K	4.0(5/32)	0.06	0.49	1.11	0.009	0.007	0.88	0.15
AWS A5.23 ENi1K		≤0.12	0.40-0.80	0.80-1.40	≤0.020	≤0.020	0.75-1.25	-
Ni-2G	4.0(5/32)	0.11	0.20	0.92	0.005	0.004	2.13	-
AWS A5.23 ENi2		≤0.12	0.05-0.30	0.75-1.25	≤0.020	≤0.020	2.10-2.90	-
F-3	4.0(5/32)	0.12	0.15	1.71	0.015	0.001	0.85	0.45
AWS A5.23 EF3		0.10-0.18	≤0.30	1.50-2.40	≤0.025	≤0.025	0.70-1.10	0.40-0.65

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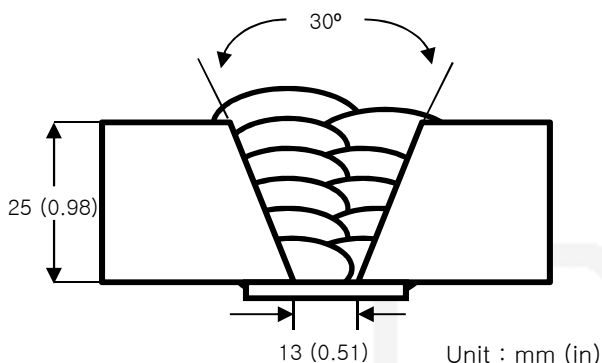


# Superflux787 X H-12K

## Mechanical Properties & Chemical Composition of All Weld Metal

### ❖ Welding Conditions

Method by AWS Rules



[ Joint Preparation & Layer Details ]

<b>Base metal</b>	: A516-60
<b>Particle size(mesh)</b>	: 10 X 48
<b>Flux type</b>	: Agglomerated
<b>Amp./ Volt./cpm</b>	: 550 / 30 / 40
<b>Stick-Out mm (in)</b>	: 30 (1.18)
<b>Pre-Heat °C (°F)</b>	: R.T .
<b>Interpass Temp. °C (°F)</b>	: <150 (302)
<b>Polarity</b>	: DC+

### ❖ Mechanical Properties of All weld metal

Consumables	PWHT Condition	Tensile Test			CVN Impact Test J (ft·lbs)
		YS MPa(lbs/in2)	TS MPa(lbs/in2)	EL (%)	-62°C (-80°F)
Superflux787 X H-12K	As-welded	491 (71,000)	575 (83,000)	32	78 (58)
	620°Cx1hr	447 (65,000)	553 (80,000)	33	89 (66)
	620°Cx12hr	438 (64,000)	540 (78,000)	34	102 (75)
	620°Cx24hr	427 (62,000)	532 (77,000)	35	101 (75)
AWS A5.17 F7A(P)8-EH12K		≥ 400	490~660	≥ 22	≥27J at -62°C

### ❖ Chemical Analysis of All weld metal (wt%)

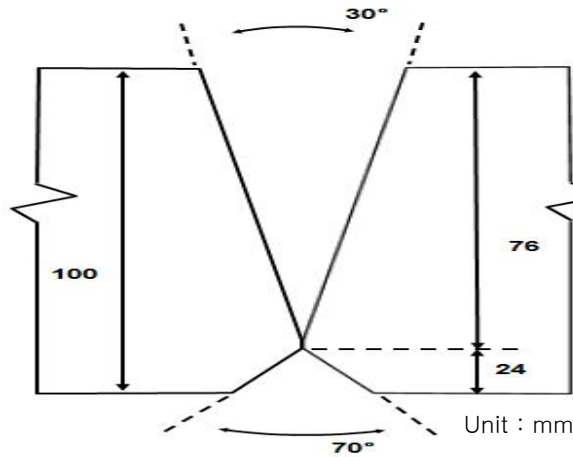
Consumables	C	Si	Mn	P	S
Superflux787 X H-12K	0.07	0.36	1.57	0.015	0.004

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## Mechanical Properties & Chemical Composition of Weld Metal

### ❖ Welding Conditions



[ Joint Preparation & Layer Details ]

<b>Base metal</b>	: A350 LF2 CL1
<b>Particle size(mesh)</b>	: 10 X 48
<b>Flux type</b>	: Agglomerated
<b>Amp./ Volt./CPM</b>	: L(DC+) : 600 / 31 / 60 T(AC) : 500 / 33
<b>Stick-Out mm (in)</b>	: 30 (1.18)
<b>Pre-Heat(°C)</b>	: 100
<b>Interpass Temp. °C (°F)</b>	: <164(327)

### ❖ Mechanical Properties of Weld metal

Consumables	PWHT Condition	Tensile Test			CVN Impact Test (Joule)
		YS MPa(lbs/in2)	TS MPa(lbs/in2)	EL (%)	-46°C (-51°F)
Superflux787 X H-12K	630°Cx5hr	318 (46,000)	502 (73,000)	Base metal	175 (129)

Consumables	PWHT Condition	Location	Hardness (Hv10)	
			Weld metal	HAZ
Superflux787 X H-12K	630°Cx5hr	Face	190	175
		3/4t	194	180

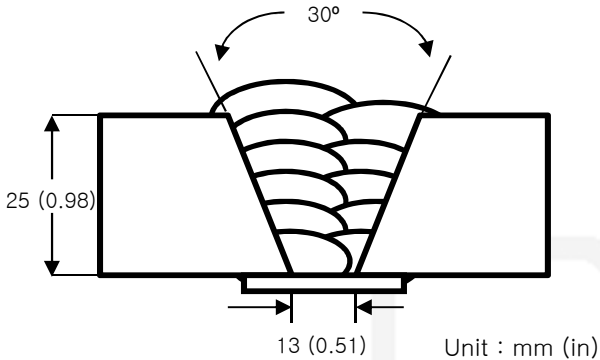
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## Mechanical Properties & Chemical Composition of All Weld Metal

### ❖ Welding Conditions

Method by AWS Spec.



[ Joint Preparation & Layer Details ]

<b>Base metal</b>	: ASTM A36
<b>Particle size(mesh)</b>	: 10 X 48
<b>Flux type</b>	: Agglomerated
<b>Amp./ Volt./CPM</b>	: 550 / 30 / 40
<b>Stick-Out mm (in)</b>	: 30 (1.18)
<b>Pre-Heat(°C)</b>	: RT
<b>Interpass Temp. °C (°F)</b>	: <164(327)
<b>Polarity</b>	: DC+

### ❖ Mechanical Properties of All weld metal

Consumables	PWHT Condition	Tensile Test			CVN Impact Test J (ft·lbs)
		YS MPa(lbs/in2)	TS MPa(lbs/in2)	EL (%)	-62°C (-80°F)
Superflux787 X H-14	As-welded	509 (74,000)	550 (80,000)	30	126 (93)
	620°Cx1hr	464 (67,000)	535 (78,000)	34	115 (85)
AWS A5.17 F7A(P)8-EH14		≥ 400	490~660	≥ 22	≥ 27J at -62°C

### ❖ Chemical Analysis of All weld metal (wt%)

Consumables	C	Si	Mn	P	S
Superflux787 X H-14	0.09	0.16	1.59	0.016	0.005

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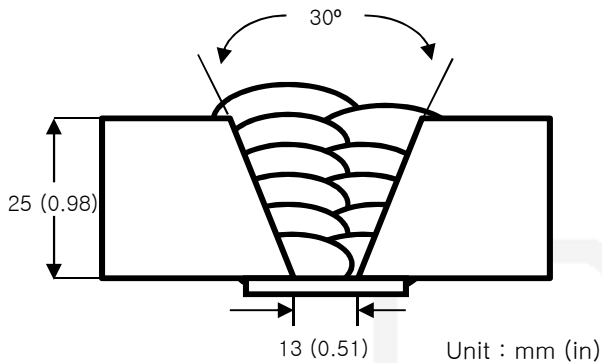


# Superflux787 X M-12K

## Mechanical Properties & Chemical Composition of All Weld Metal

### ❖ Welding Conditions

Method by AWS Rules



[ Joint Preparation & Layer Details ]

<b>Base metal</b>	: ASTM A36
<b>Particle size(mesh)</b>	: 10 X 48
<b>Flux type</b>	: Agglomerated
<b>Amp./ Volt./CPM</b>	: 550 / 30 / 40
<b>Stick-Out mm (in)</b>	: 30 (1.18)
<b>Pre-Heat °C (°F)</b>	: R.T .
<b>Interpass Temp. °C (°F)</b>	: <150 (302)
<b>Polarity</b>	: DC+

### ❖ Mechanical Properties of All weld metal

Consumables	PWHT Condition	Tensile Test			CVN Impact Test J (ft·lbs)	
		YS MPa(lbs/in2)	TS MPa(lbs/in2)	EL (%)	-51°C (-60°F)	-62°C (-80°F)
Superflux787 X M-12K	As-welded	445 (65,000)	495 (72,000)	36	170 (125)	89 (66)
	620°C x 1hr	395 (57,000)	475 (69,000)	37	182 (134)	125 (92)
AWS A5.17 F6A(P)6-EM12K		≥ 330	430-560	≥ 22	≥ 27J at -51°C	

### ❖ Chemical Analysis of All weld metal (wt%)

Consumables	C	Si	Mn	P	S
Superflux787 X M-12K	0.07	0.29	1.07	0.018	0.003

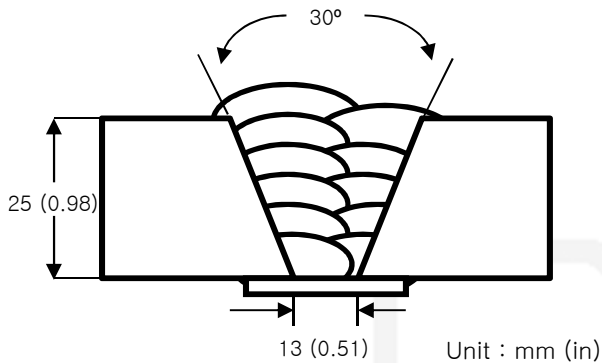
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## Mechanical Properties & Chemical Composition of All Weld Metal

### ❖ Welding Conditions

Method by AWS Rules



[ Joint Preparation & Layer Details ]

<b>Base metal</b>	: A537 Cl2
<b>Particle size(mesh)</b>	: 10 X 48
<b>Flux type</b>	: Agglomerated
<b>Amp./ Volt./CPM</b>	: 550 / 30 / 40
<b>Stick-Out mm (in)</b>	: 30 (1.18)
<b>Pre-Heat °C (°F)</b>	: R.T .
<b>Interpass Temp. °C (°F)</b>	: <164(327)
<b>Polarity</b>	: DC+

### ❖ Mechanical Properties of All weld metal

Consumables	PWHT Condition	Tensile Test			CVN Impact Test J (ft·lbs)	
		YS MPa(lbs/in2)	TS MPa(lbs/in2)	EL (%)	-51°C (-60°F)	-62°C (-80°F)
Superflux787 X Ni-5	As welded	592 (86,000)	614 (89,000)	31	124 (92)	83 (61)
	620°Cx1hr	541 (78,000)	591 (86,000)	33	113 (83)	76 (56)
	620°Cx10hr	515 (75,000)	579 (84,000)	34	102 (75)	70 (52)
AWS A5.23 F8A(P)8-ENi5-Ni1		≥ 470	550~690	≥ 20	≥ 27J at -62°C	

### ❖ Chemical Analysis of All weld metal(wt%)

Consumables	C	Si	Mn	P	S	Ni	Cr	Mo	Ti+V+Zr
Superflux787 X Ni-5	0.06	0.34	1.38	0.015	0.003	0.83	0.05	0.22	0.015
AWS A5.23 Ni1	≤ 0.12	≤ 0.80	≤ 1.60	≤ 0.030	≤ 0.025	0.75- 1.10	≤ 0.15	≤ 0.35	≤ 0.05

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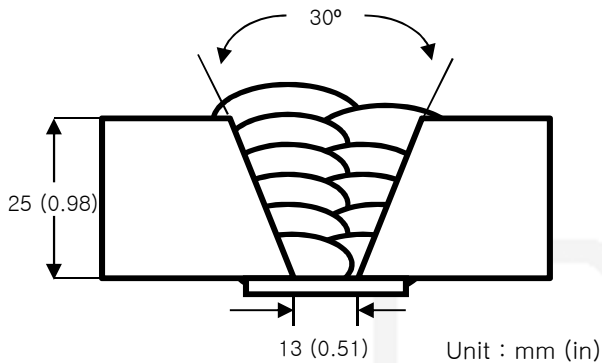




## Mechanical Properties & Chemical Composition of All Weld Metal

### ❖ Welding Conditions

Method by AWS Rules



[ Joint Preparation & Layer Details ]

<b>Base metal</b>	: A537 Cl2
<b>Particle size(mesh)</b>	: 10 X 48
<b>Flux type</b>	: Agglomerated
<b>Amp./ Volt./CPM</b>	: 550 / 30 / 40
<b>Stick-Out mm (in)</b>	: 30 (1.18)
<b>Pre-Heat °C (°F)</b>	: R.T .
<b>Interpass Temp. °C (°F)</b>	: <164(327)
<b>Polarity</b>	: DC+

### ❖ Mechanical Properties of All weld metal

Consumables	PWHT Condition	Tensile Test			CVN Impact Test J (ft·lbs)	
		YS MPa(lbs/in2)	TS MPa(lbs/in2)	EL (%)	-40°C (-40°F)	-51°C (-60°F)
Superflux787 X Ni1-K	As welded	556 (81,000)	607 (90,000)	30	90 (66)	82 (61)
	620°Cx1hr	513 (74,000)	585 (86,000)	31	110 (81)	105 (77)
	620°Cx10hr	476 (96,000)	556 (81,000)	31	112 (83)	109 (80)
AWS A5.23 F8A(P)6-ENi1K-Ni1		≥ 470	550~690	≥ 20	≥ 27J at -51°C	

### ❖ Chemical Analysis of All weld metal(wt%)

Consumables	C	Si	Mn	P	S	Ni	Cr	Mo	Ti+V+Zr
Superflux787 X Ni1-K	0.05	0.51	1.17	0.017	0.005	0.83	0.07	0.12	0.022
AWS A5.23 Ni1	≤ 0.12	≤ 0.80	≤ 1.60	≤ 0.030	≤ 0.025	0.75- 1.10	≤ 0.15	≤ 0.35	≤ 0.05

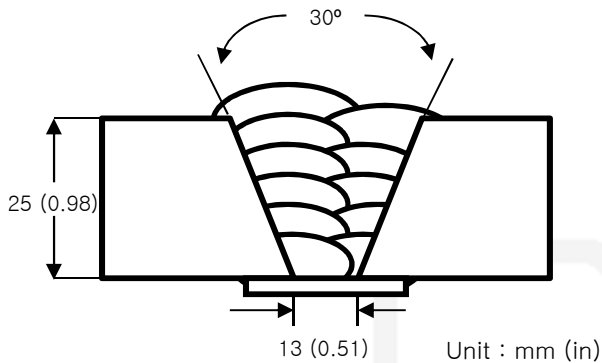
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## Mechanical Properties & Chemical Composition of All Weld Metal

### ❖ Welding Conditions

Method by AWS Rules



[ Joint Preparation & Layer Details ]

<b>Base metal</b>	: AH36(Buttering)
<b>Particle size(mesh)</b>	: 10 X 48
<b>Flux type</b>	: Agglomerated
<b>Amp./ Volt./CPM</b>	: 550 / 30 / 40
<b>Stick-Out mm (in)</b>	: 30 (1.18)
<b>Pre-Heat °C (°F)</b>	: R.T .
<b>Interpass Temp. °C (°F)</b>	: <164(327)
<b>Polarity</b>	: DC+

### ❖ Mechanical Properties of All weld metal

Consumables	PWHT Condition	Tensile Test			CVN Impact Test J (ft·lbs)	
		YS MPa(lbs/in2)	TS MPa(lbs/in2)	EL (%)	-62°C (-80°F)	-79°C (-110°F)
Superflux787 X Ni-2G	As welded	501 (73,000)	592 (86,000)	30	102 (75)	44 (32)
	620°Cx1hr	482 (70,000)	569 (83,000)	31	95 (70)	37 (27)
AWS A5.23 F8A8-ENi2-G		≥ 470	550~690	≥ 20	≥ 27J at -62°C	

### ❖ Chemical Analysis of All weld metal(wt%)

Consumables	C	Si	Mn	P	S	Ni
Superflux787 X Ni-2G	0.06	0.35	1.09	0.013	0.004	1.92
AWS A5.23 Ni2	≤0.12	≤0.80	≤1.60	≤0.030	≤0.025	2.00-2.90
AWS A5.23 G	Not specified					

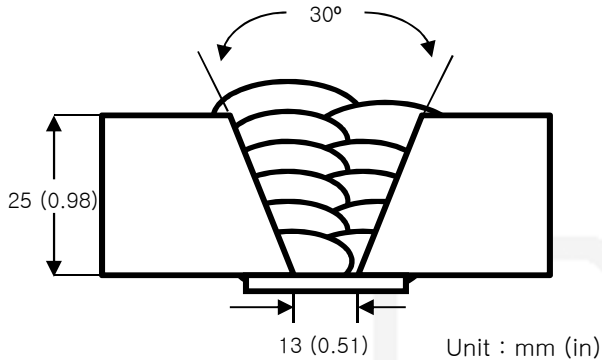
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## Mechanical Properties & Chemical Composition of All Weld Metal

### ❖ Welding Conditions

Method by AWS Rules



[ Joint Preparation & Layer Details ]

<b>Base metal</b>	: AH36(Buttering)
<b>Particle size(mesh)</b>	: 10 X 48
<b>Flux type</b>	: Agglomerated
<b>Amp./ Volt./CPM</b>	: 550 / 30 / 40
<b>Stick-Out mm (in)</b>	: 30 (1.18)
<b>Pre-Heat °C (°F)</b>	: R.T .
<b>Interpass Temp. °C (°F)</b>	: <164(327)
<b>Polarity</b>	: DC+

### ❖ Mechanical Properties of All weld metal

Consumables	PWHT Condition	Tensile Test			CVN Impact Test J (ft-lbs)
		YS MPa(lbs/in2)	TS MPa(lbs/in2)	EL (%)	-62°C (-80°F)
Superflux787 X F-3	As welded	675 (98,000)	729 (106,000)	26	98 (72)
	620°Cx1hr	647 (94,000)	719 (104,000)	28	63 (46)
AWS A5.23 F9A(P)8-EF3-F3		≥ 540	620 ~760	≥ 17	≥ 27J at -62°C

### ❖ Chemical Analysis of All weld metal(wt%)

Consumables	C	Si	Mn	P	S	Ni	Mo
Superflux787 X F-3	0.07	0.35	1.69	0.019	0.003	0.84	0.47
AWS A5.23 F3	≤0.17	≤0.80	1.25-2.25	≤0.03	≤0.03	0.70-1.10	0.40-0.65

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## Diffusible Hydrogen Test

### ❖ Welding Conditions

Method by AWS Rules

<b>Wire</b>	: <b>H-12K</b> <b>H-14</b>	<b>Amp.(A) / Volts(V)</b>	: 550/29
<b>Diameter(mm)</b>	: 4.0(5/32)	<b>Stick-Out(mm)</b>	: 30
<b>Flow Rate(ℓ /min.)</b>	: -	<b>Welding Speed</b>	: 42 CPM
<b>Welding Position</b>	: 1G (PA)	<b>Current Type &amp; Polarity</b>	: DC+

### ❖ Hydrogen content (ml/100g)

	X1	X2	X3	X4	Av.
<b>Superflux787 X H-12K</b>	3.1	3.3	3.3	3.7	3.4
<b>Superflux787 X H-14</b>	3.6	3.8	3.5	3.6	3.6

\* Test Method : AWS A4.3 Gas Chromatography method

## Class Society Approval

### ❖ Authorized Approval Details

Consumables	KR	ABS	LR	BV	DNV	GL	NK	CCS
<b>Superflux787 X H-14</b>	4YM 1.2~6.4	3M, 4YM 1.6~6.4	3M, 4YM 1.6~6.4	A4YM 1.2~6.4	IVYM 1.6~6.4	4YM 1.2~6.4	KAW54M 1.2~6.4	4YM 1.2~6.4
<b>Superflux787 X H-12K</b>		4YM H5 1.6~6.4						

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