



LS HTS CABLE SYSTEM

22.9~200kV AC/DC Cable & Cryogenic System



THE WORLD BEST CABLE SOLUTION LEADER

LS Cable & System supplies various cables and materials used for power grids and communication networks around the world across all industries providing its top class technology and excellent quality. The company has also developed state of the art products, such as superconductors, HVDC and submarine cables that will lead the future energy industry.

LS spun off from LG in 2003 as a group specializing in electronics, electrical systems, energy and materials.



LS Cable & System
Transmission Cable
Distribution Cable
Submarine Cable
Telecommunication Cable
Industrial Cable
Industrial Material

LS ELECTRIC
Electric &
Automatic Equipments

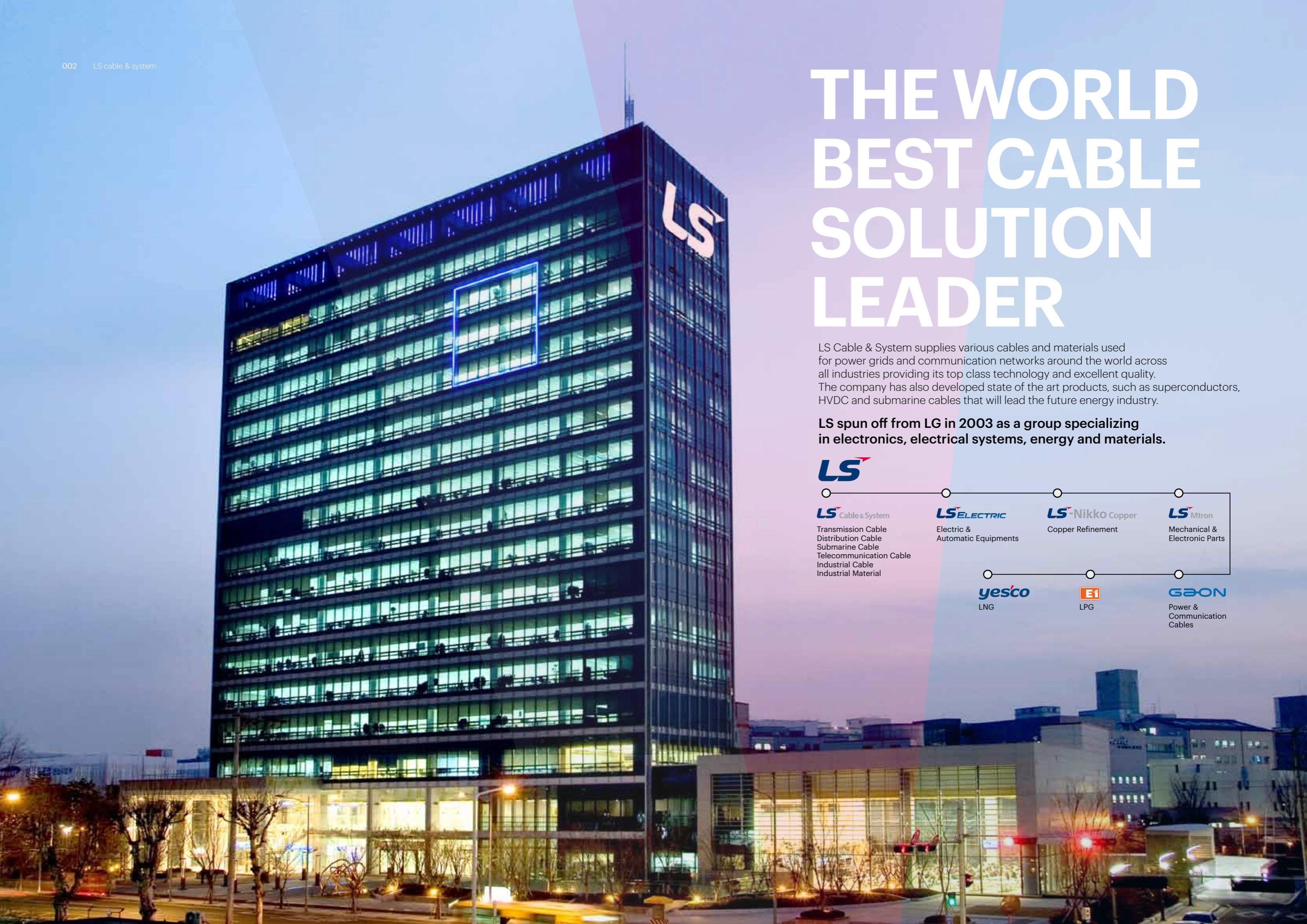
LS-Nikko Copper
Copper Refinement

LS Mitron
Mechanical &
Electronic Parts

yesco
LNG

E1
LPG

GBON
Power &
Communication
Cables





LS HTS Cable System

2011 marks the 100th year since the discovery of superconductivity.

Superconductivity is a phenomenon in which electric resistance of a substance becomes zero when the substance is cooled down to a certain temperature. By removing electric resistance, electrical transmission loss can be remarkably lowered. Once superconductive cable, the 'dream cable' is commercialized in full scale by applying the superconductivity to cable technology, it will contribute significantly to reducing power loss adding to KRW 1.2 trillion a year in Korea and also to environmental protection.

We realize the dream pursued over the last 100 years.

LS Cable & System's superconductive power cable, an innovative energy transfer technology, is created using high-temperature superconductor and there is capable of large-scale power transmission. As an innovative new-concept power cable incurring absolutely no transmission loss, LS Cable & System's superconductive power cable is scheduled for commercialization in 2012 as the first in the world.

For the green earth and the future full of children' laughter...

Based on the advanced superconductive cable technology, LS Cable & System will be an innovative leader in the eco-friendly smart grid era.

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Construction of HTS Cable

Construction of HTS Cable

Construction Details

Items	Construction Details
Conductor Stabilizer	• Pass of Fault Current
HTS Layer(Conductor)	• Transport of current • 2G HTS wires to be winded based on required ratings
Electrical Insulation	• High Quality PPLP tapes
HTS Layer(Shield)	• Pass of screen current, shield of electromagnetic field • 2G HTS wires to be winded based on required ratings
Inner Cryostat	• Extruded corrugated and seamless aluminum
Thermal Insulation	• Multi layer insulation in vacuum space • Thermal isolation from ambient temperature
Outer Cryostat	• Extruded layer of corrugated and seamless aluminum • Protection the HTS cable core from external damages
Outer Sheath	• Anti-corrosion protection • Electrode for the voltage test on the jacket(graphite coating)

LS HTS Cable System

22.9~200kV AC/DC HTS Cable & Cryogenic System

Solution for High Capacity and Low Loss Underground Transmission system



Cable Construction

- Conductor Stabilizer
- HTS Conductor
- Electrical Insulation
- HTS Layer(Shield)
- Inner Cryostat
- Thermal Insulation
- Outer Cryostat
- Outer Sheath



HTS Cables

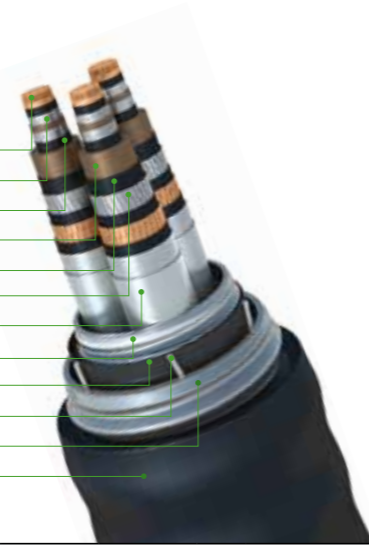
22.9kV AC HTS Cable

Application

- Bulk Power Underground Transmission
- Distributed Power Links

Cable Construction

- Conductor Stabilizer
- HTS Phase Conductor
- Conductor Screen
- Electrical Insulation
- Insulation Screen
- HTS Shield
- Core Binder
- Inner Cryostat
- Thermal Insulation
- Vacuum Spacer
- Outer Cryostat
- Outer Sheath



Technical Descriptions

22.9kV 50/150MVA 3Core HTS Cable

Ratings			Construction					Cable Constants					
Normal	Short Circuit	Stabilizer	HTS Conductor	Insulation Thickness	HTS Shield	Core Binder	Outer Sheath	Resistance	Inductance	Capacitance	Loss		Weight
MVA	kA/0.5s	mm ²	mm ²	mm	mm ²	mm	mm				uΩ/km	mH/km	
50	25	260	11.3	4.6	9.2	39.56	150.9	0.0148	0.1	0.26	3.6	2.4	28.56
150	40	260	34.0	4.6	27.7			0.0049		0.26			

200kV DC HTS Cable

Application

- Bulk Power Underground Transmission
- Distributed Power Links

Cable Construction

- Conductor Stabilizer
- HTS Conductor
- Conductor Screen
- Electrical Insulation
- Insulation Screen
- Core Binder
- Inner Cryostat
- Thermal Insulation
- Vacuum Spacer
- Outer Cryostat
- Outer Sheath



Technical Descriptions

200kV 5GW DC HTS Cable

Ratings			Construction					Cable Constants					
Normal	Short Circuit	Stabilizer	HTS Conductor	Insulation Thickness	HTS Shield	Core Binder	Outer Sheath	Resistance	Inductance	Capacitance	Loss		Weight
MVA	kA/0.5s	mm ²	mm ²	mm	mm ²	mm	mm				uΩ/km	mH/km	
50	25	260	11.3	4.6	9.2	39.56	150.9	0.0148	0.1	0.26	3.6	2.4	28.56

154kV AC HTS Cable

Application

- Bulk Power Underground Transmission
- Distributed Power Links

Cable Construction

- Conductor Stabilizer
- HTS Conductor
- Conductor Screen
- Electrical Insulation
- Insulation Screen
- HTS Shield
- Core Binder
- Inner Cryostat
- Thermal Insulation
- Vacuum Spacer
- Outer Cryostat
- Outer Sheath



Technical Descriptions

154kV 1GVA HTS Cable

Ratings			Construction					Cable Constants					
Normal	Short Circuit	Stabilizer	HTS Conductor	Insulation Thickness	HTS Shield	Core Binder	Outer Sheath	Resistance	Inductance	Capacitance	Loss		Weight
GVA	kA/1.7s	mm ²	mm ²	mm	mm ²	mm	mm				uΩ/km	mH/km	
1	50	600	23.1	15.0	21	75.9	141.5	0.0073			2.5	2.5	26.72

HTS Accessories

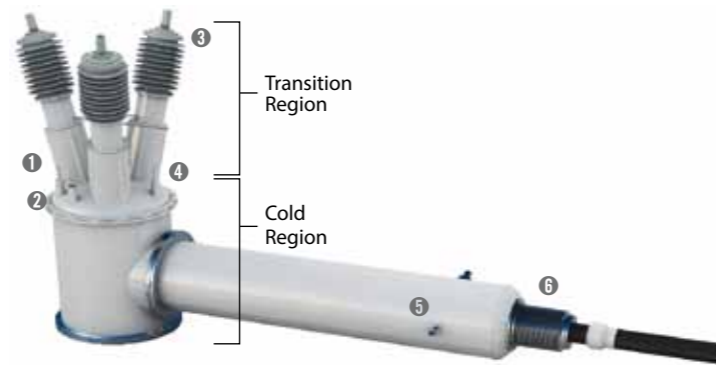
Termination

Application

- Termination for 22.9kV 50MVA HTS cable
- Connection to conventional power grid

Construction

- 1 Safety V/V Port
- 2 Liquid Nitrogen Port
- 3 Composite insulator
- 4 Pressure sensor port
- 5 Temperature sensor port
- 6 Bellows



Technical Descriptions

Termination for 22.9kV HTS cable

Ratings			Construction			Characteristics			
Normal	Short Circuit	Cablelength	Height	Length	Safety	Nominal Pressure	Vacuumrate @ 77K	Leak rate	Heat loss
MVA	kA	M	mm	mm	-	barG	Torr	mbar-l/sec	W
50	25	500	2,400	4,980	Relief V/V Ruptur Disc. Seal off V/V	7.5	$< 5 \times 10^{-5}$	$< 1.41 \times 10^{-9}$	< 100

Joint

Application

- Normal Joint for 22.9kV 50MVA HTS cable
- Connection to HTS cable

Construction

- 1 Vacuum port for NJ
- 2 Temperature sensor port
- 3 Bellows
- 4 Vacuum port for cable

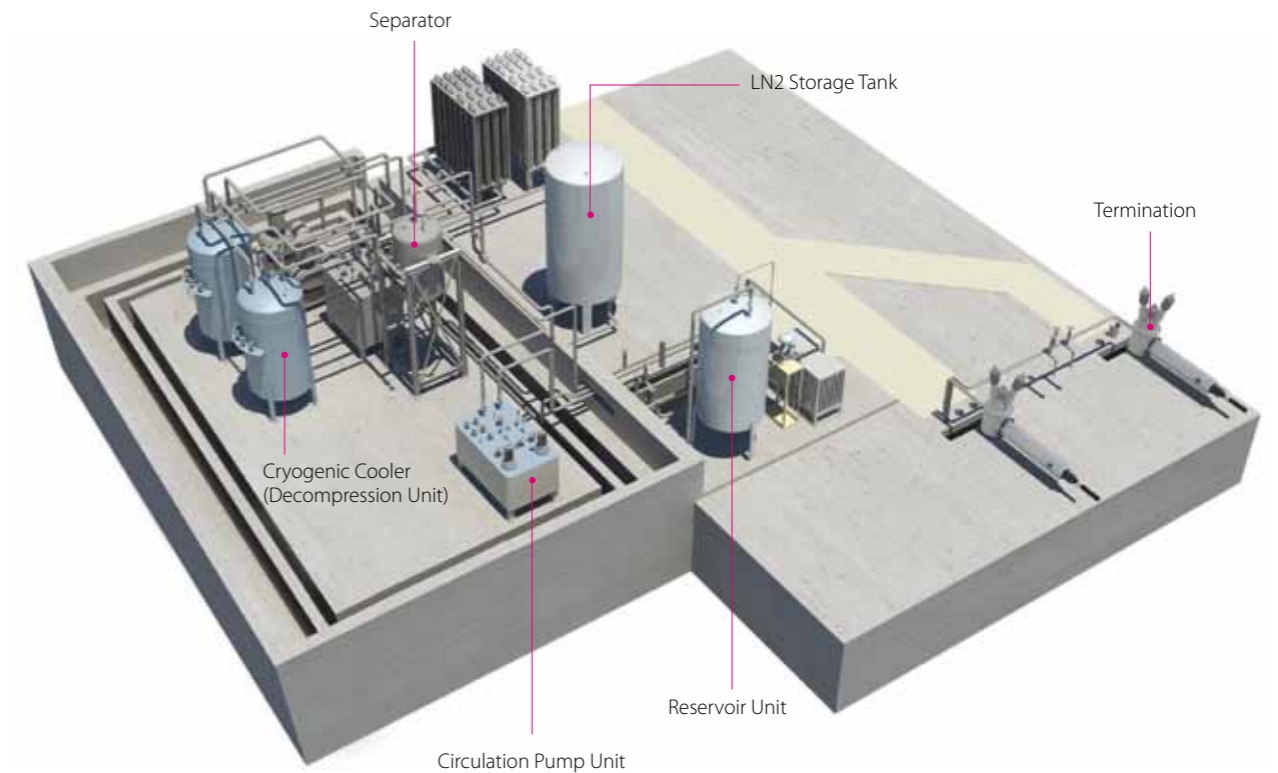


Technical Descriptions

Normal Joint for 22.9kV HTS cable

Ratings			Construction			Characteristics			
Normal	Short Circuit	Cablelength	Height	Length	Safety	Nominal Pressure	Vacuumrate @ 77K	Leak rate	Heat loss
MVA	kA	M	mm	mm	-	barG	Torr	mbar-l/sec	W
50	25	500	460	4,030	Seal off V/V	7.5	$< 5 \times 10^{-5}$	$< 1.42 \times 10^{-9}$	< 25

Cryogenic System



Technical Data

Item	Characteristics	Unit	Value
Cryogenic Cooler (Decompression Unit)	Cooling Capacity	kW	Max. 20
	Cooling Coverage	km	Max. 2.0
	Temperature Control	K	68K ~ 75K
Circulation Pump Unit	Flow Rate	Kg/s	Nom. 0.6
Reservoir Unit	Pressure	Bar	Max. 10
Separator Unit	LN2 Filling Control	-	
LN2 Storage Tank	Volume	ton	5
Monitoring Panel	Touch Panel Type		
Control System	Automatic Control		

Cryogenic Control System



Project Experience

Icheon S/S

22.9kV 50MVA HTS Cable System
Installed at Icheon S/S
Rough length of 410m
a joint, 2 terminations
Cryogenic system
Commissioned at June 2011



- 01 22.9kV 50MVA HTS Cable
- 02 Termination
- 03 Joint
- 04 Cooling System
- 05 Offset System

Project Experience

Gochang Power Testing Center



22.9 kV 50MVA HTS Cable System

- Installed at Gochang Power Testing Center
- Route length of 100m
- a joint and 2 terminations
- Cryogenic system
- Completed at november, 2007.

Type Test Certificate





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