

ESPEC

Liquid to Liquid  
**Thermal Shock Chamber**  
TSB-21•TSB-51



CAT.NO.E03137-Z409

# Key technology for ensuring reliability Supports the current trend toward higher stress.

High accuracy is increasingly demanded in the pursuit of reliability in the field of electronics.

“ Liquid-to-liquid ”type thermal shock testing is now attracting attention for its ability to impose higher thermal stress on specimens than “ air-to-air ”type testing, and to deliver test results quickly.

ESPEC has successfully developed next-generation liquid-to-liquid thermal shock chambers that satisfy the demand for environmental conservation and lower running costs from brine and power consumption, which have traditionally been regarded as stumbling blocks with liquid-to-liquid thermal shock chambers.

ESPEC takes great pride in offering this cutting-edge chamber as a key technology in ensuring higher reliability.

TSB - 51



- **A number of mechanisms for drastically reducing brine consumption**

To reduce brine consumption, the airtightness of the test area has been enhanced to prevent vapor leakage and brine evaporation. Numerous mechanisms have also been adopted, including a water separation filter for removing brine from water for the purpose of brine recycling. As a result, these new chamber models have reduced brine consumption by approximately 65% compared to the preceding model (TSB-5).



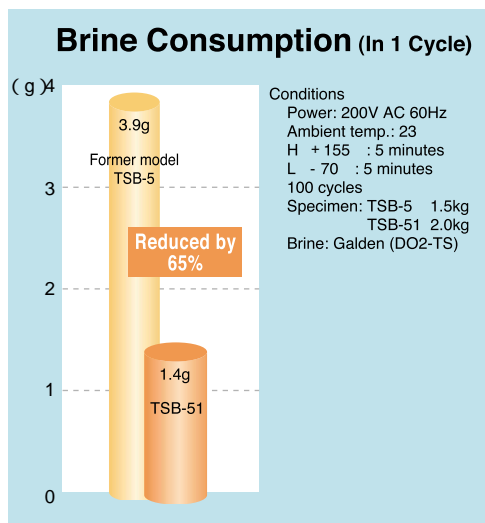
Test Area

- **Both single-liquid and double-liquid brine applicable**

Either single-liquid brine or double-liquid brine can be selected simply by switching the valve.

- **Two models available to suit the specimen size and weight**

Two different models are available: TSB-21 can hold specimens weighing up to 1.0 kg, while TSB-51 can hold specimens weighing up to 2.0 kg. Capable of handling a wide variety of electronic parts, from ICs to printed circuit boards.

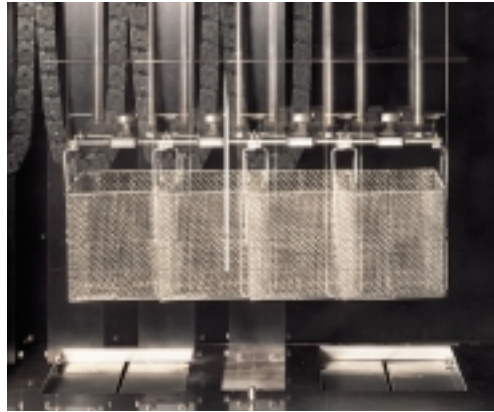


- **Installation environment improved through reduced operation noise**

The operation noise level of the chamber has been reduced to as low as 61 dB (A-characteristic) by providing sound-proofing panels for the noise-emitting machine compartment, including the refrigerator.

- **HFC refrigerant used to protect the global environment**

HFC refrigerant that causes no damage to the ozone layer is used for the refrigerator, and thus complies with the measures for ozone-layer protection specified by the Montreal Protocol.



- **Smooth transfer of specimens realized**

An air cylinder system that suppresses vibration of the specimens and a new specimen loading system that prevents unnecessary stress to the specimens during transfers between the hot bath and the cold bath.

- **Energy savings achieved**

Dramatic energy savings have been achieved through the adoption of a new refrigeration circuit, with power consumption slashed by as much as 52% (compared to former ESPEC models).

- **Required installation space reduced by more than 15%**

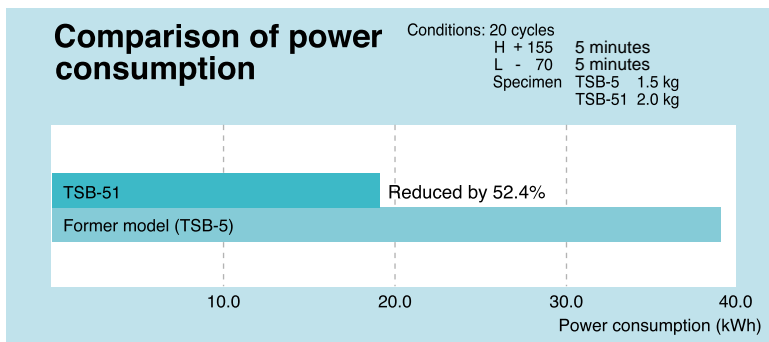
The downsizing of the chamber, attained through the adoption of a new refrigeration circuit, has translated to a reduction in installation space greater than 15%, enabling more effective use of the floor space.

- **Chamber weight reduced**

The chamber itself is also 180 kg lighter than its predecessor (TSB-5), for easy transport. This reduces the load capacity required at the installation location.

- **Paperless Recording (optional)**

The paperless recorder makes it easy record the temperatures of different components, such as the chamber temperature, on a memory card (Compact Flash).



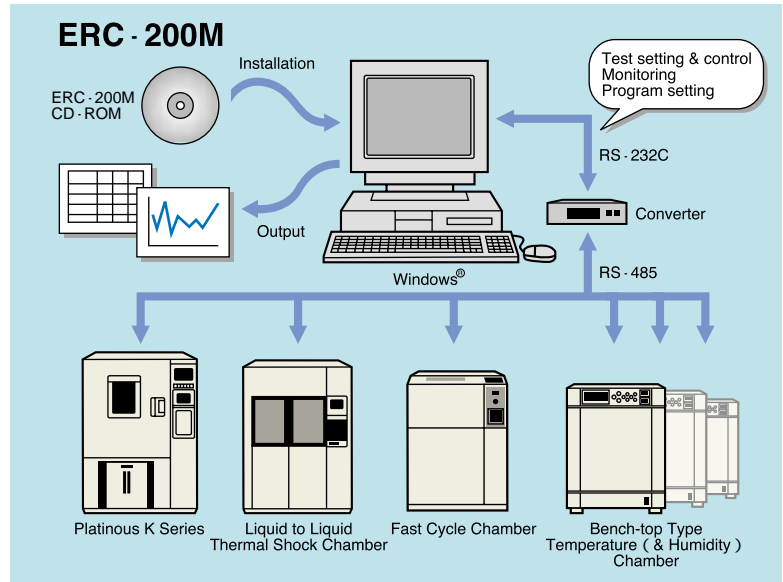
Above values are references.



Paperless recorder (optional) \*Sample photo

## Communication Network of Environmental Test Chambers

The liquid to liquid thermal shock chamber incorporates the communication port RS-485 as standard to cope with the [ E-PILOT 21 ], which is a newly developed centralized control system. [ E-PILOT 21 ] not only serves as a system for centralized control of environmental chambers, but also establishes an open network including specimen measurement function and remote chamber maintenance function.



### E . PILOT (ERC-200M)

Control, monitoring, programming, and datalogging for up to 16 ESPEC chambers can be performed through a single PC. RS-485 from ESPEC chambers connect via a serial bus converter to RS-232C on the PC.  
(Monitoring only for liquid to liquid thermal shock chambers)

#### Remote operation

Have full control of test chambers while sitting in your office.

#### E-BUS version available

For existing units with E-BUS system, ERC-100M is available.

### E . PILOT (ERC-300M)

Set up an Intranet Web-PILOT site to allow monitoring of up to 16 chambers (as for liquid to liquid thermal shock chamber up to 4 chambers) through one PC (possible with E-BUS communications system). Monitor the settings and operation of your chambers from any PC on the Intranet. Web-based method allows display of chamber information across many computer platform types.

\* The series of application softwares and network systems are provided on a separate basis from the chamber.

### E . PILOT (Lab-VIEW)

Provides an interlocking system of testing and measuring devices that allows customers currently using Lab-VIEW to link to ESPEC chambers, opening new horizons for environmental testing. Optional E-BUS communications interface is required.

Driver software to connect test chambers are provided for free

Lab VIEW drivers are available to give the basic building blocks for addressing ESPEC equipment. Drivers required for connecting ESPEC products to a personal computer is provided for free. For further information, please contact your nearby ESPEC sales office.

### CMS . J30

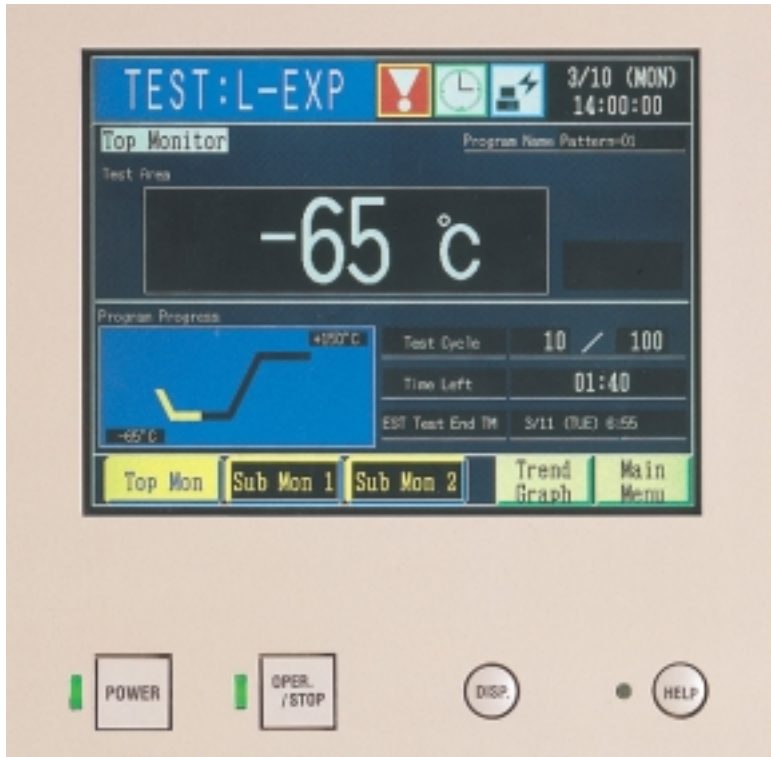
This is a fully customizable system that provides centralized control, centralized monitoring, remote operation and specimen data management of ESPEC products (up to 32 units of which 16 are dedicated to centralized monitoring) by the use of a PC. (E-BUS compatible)

\* Please contact us for further information.



# Control operation

## Visibility and ease of use improved through interactive input using a touch-screen system and color LCD screen



- Uses a color LCD interactive touch-screen system employed throughout the Thermal Shock Chamber Series

A color LCD panel design allows settings to be made simply by touching the screen in accordance with the display. The test pattern, test area temperature, number of temperature cycles, trend-graph display, etc., are all displayed on the screen.

Setting system	Interactive input system using a touch panel
Display	Color TFT LCD panel (6.5 inch)
Temperature-control	<ul style="list-style-type: none"> <li>• Test area exposure temperature</li> <li>• Hot bath preheating temperature</li> <li>• Cold bath precooling temperature</li> <li>• Liquid temperature recovery for hot bath</li> <li>• Liquid temperature recovery for cold bath</li> </ul>
Temperature-setting range	High-temperature side: + 60 to + 200 Low-temperature side : - 75 to 0
Setting resolution	1
Input	Thermocouple T (JIS C 1602)
Control system	PID control
Time-setting range	1 sec. to 99 min. 59 sec.
Cycle-setting range	1 to 9999 cycles
Programs	RAM mode: Max. 40 patterns (writable) ROM mode: 10 standard test patterns (registered)
Auxiliary functions	<ul style="list-style-type: none"> <li>• Timer preset</li> <li>• Test continuity selection</li> <li>• Overheat/overcool protection</li> <li>• Stable time control</li> <li>• Power-saving operation</li> <li>• Power-failure/ recovery operation selection</li> <li>• Liquid temperature recovery</li> <li>• Recycling operation</li> <li>• Automatic preheating/ precooling setting</li> <li>• Time signal</li> <li>• Program memory</li> <li>• Automatic power shutoff</li> <li>• Programmed time display</li> <li>• Test starting point selection</li> <li>• Test halt preset</li> <li>• Test completion mode selection</li> <li>• Trend graph</li> <li>• Alarm history display</li> <li>• Sensor calibration</li> <li>• RS-485 communication</li> </ul>

### ● Detailed test monitoring

The test area temperature, hot bath temperature, cold bath temperature, operation parameter setting, external output setting, and safety device setting are displayed.



### ● Selection of operating modes

Select the chamber operating mode.



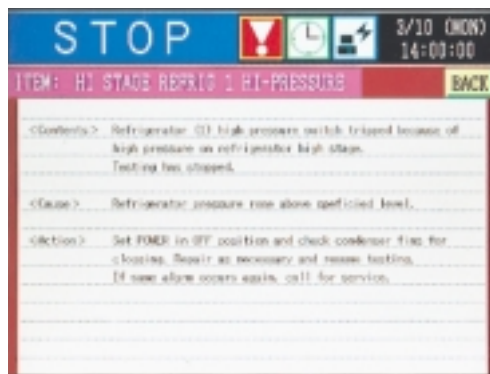
### ● Test pattern editing

The system comes with programs for ten typical thermal-test standard patterns. It also allows registration of user programs for up to 40 desired test patterns.



### ● Error description

In the event of a problem, the system indicates its nature on the alarm screen, as well as the date and time of its occurrence, and displays the cause and corrective and resetting procedures on the following screen.



## TEST STANDARDS (satisfied by all models in the TSB Series)

Test Standard	Test Condition	Exposure Temperature			Exposure Time		Temperature Recovery Time	Number of Test Cycles	Test Starting Point
		High Temp.	Ambient Temp.	Low Temp.	High/ Low Temp.	Ambient Temp.			
MIL-STD-883E (Method No. 1011.9)	A	+ 100 + 10 - 2	————	0 + 2 - 10	Over 2 min., up to 5 min.	————	Temperature of the specimen under worst- case conditions, recovered within 5 min.	Min. 15 cycles	Low temp. or high temp.
	B	+ 125 + 10 0	————	- 55 0 - 10		————			
	C	+ 150 + 10 0	————	- 65 0 - 10		————			
MIL-STD-202G (Method No. 107G)	A	+ 100 + 10 - 2	————	0 + 2 - 10	Varies by specimen weight Less than 1.4 g: 0.5 min. 1.4 g to 14 g: 2 min. Over 14 g to 140 g: 5 min.	————	————	5 cycles 15 cycles 25 cycles	Low temp.
	B	+ 125 + 10 0	————	- 65 0 - 10		————			
	C	+ 150 + 10 0	————	————		————			
JIS C 0025	————	+ 100	————	0	5 min. to 20 min.	————	————	10 cycles unless otherwise specified	Low temp.



## SPECIFICATIONS

Model		TSB-21	TSB-51	
System		Two-liquid bath system with specimen basket transfer		
Brine		Single-liquid or double-liquid fluorine deactivated brine		
Utility requirement	Power supply (within $\pm 10\%$ of the rated voltage)	200V AC, 3 , 3W, 50/60Hz		
	Maximum load current	25A	43A	
	Operating temperature	0 to + 40 ( + 32 to + 104° F)		
	Air-source pneumatic pressure	0.4 to 0.7MPa (4 to 7kgf/ cm <sup>2</sup> )		
	Air-source piping connection size	8mm		
	Required air-flow quantity	15L/ min. (ANR) 3.6L/ cycle (ANR)		
	Performance*1	Hot bath	Temp. range	+ 70 to + 200 ( + 158 to + 392° F)
Temp. fluctuation*2			$\pm 2$ ( $\pm 3.6^\circ$ F)	
Temp. heat-up rate*3			Ambient temp. to +150 ( + 302° F): within 90 min.	
Temp. pull-down rate*3			+ 150 to + 60 ( + 302 to + 140° F) Within 60 min.	+ 150 to + 60 ( + 302 to + 140° F) Within 100 min.
Cold bath		Temp. range	- 65 to 0 ( - 85 to + 32° F)	
		Temp. fluctuation*2	$\pm 2$ ( $\pm 3.6^\circ$ F)	
		Temp. heat-up rate*3	- 65 to 0 ( - 85 to + 32° F) Within 60 min.	- 65 to 0 ( - 85 to + 32° F) Within 65 min.
		Temp. pull-down rate*3	Ambient temp. to - 65 ( - 85° F) Within 120 min.	Ambient temp. to - 65 ( - 85° F) Within 90 min.
Test performance	Hot bath	Liquid temp.	+ 150 <sup>+10</sup> <sub>0</sub> ( + 302 <sup>+18</sup> <sub>0</sub> ° F) (Galden DO2-TS)	
	Cold bath	Liquid temp.	- 65 <sup>0</sup> <sub>10</sub> ( - 85 <sup>0</sup> <sub>18</sub> ° F) (Galden DO2-TS)	
	Exposure time		High and low temperatures 5 min. each	
	Number of cycles		15 cycles	
	Specimen		Plastic molded ICs 1.0kg	Plastic molded ICs 2.0kg
Specimen transfer time		Within 10 sec. (Time of transfer between hot and cold baths)		
Noise level *4		65 dB or less		
Construction	Exterior material		Painted steel	
	Internal tank		Stainless steel plate (18-8 Cr-Ni)	
	Insulation		Glass wool, foamed polyurethane	
	Heater		Sheathed heater	
	Cooler		Cooling-pipe coil	
	Agitator		2 units (one each for the hot and cold baths)	
	Refrigerator unit		Refrigeration system: Mechanical cascade refrigeration system (Air-cooled condenser)	
	Compressor		Rotary compressor	
	Refrigerant		R508A, R404A	
	Specimen transfer unit		Pneumatic drive system for horizontal and vertical transfer	
	Brine recycling circuit		System: Condensed recovery through refrigerator cooling Refrigerator: Cold bath cooling refrigerator	
	Condensation circuit		System: Condensation by refrigerator Refrigerator: Cold bath cooling refrigerator	
	Miscellaneous		Liquid-level indicator, chamber lamp, specimen transfer-area door, adjuster, specimen power-supply control terminal, time signal, integrating hour meter	
	Outside dimensions (W x H x Dmm)*5		1140 x 1785 x 1240 (44.9 x 70.3 x 48.8in)	1200 x 1785 x 1320 (47.2 x 70.3 x 52in)
Inside bath dimensions (W x H x D mm)		260 x 350 x 440 (10.2 x 13.8 x 17.3in) (Approx. 40L)	290 x 350 x 520 (11.4 x 13.7 x 20.4in) (Approx. 55L)	
Test area internal capacity (L)		Approx. 2.1	Approx. 4.5	
Specimen basket dimensions (W x H x D mm)		120 x 150 x 120 (4.7 x 5.9 x 4.7in)	150 x 150 x 200 (5.9 x 5.9 x 7.8in)	
Specimen basket load capacity (kg) (evenly distributed load)		1.0	2.0	
Chamber (overall) weight (kg)*6		Approx. 650	Approx. 790	

\*1 Performance at an ambient temperature of +23

\*2 Performance indications conforming to JTM K01-1998

\*3 Performance when each bath is operated individually

\*4 Value measured in an anechoic room at 1m from the chamber front and at a height of 1.2 m above the floor (A-characteristic)

\*5 Protrusions from the machine sides excluded. Leveller height not included.

\*6 Weight of the liquid not included

## SAFETY DEVICES

Locking mechanism for specimen transfer area door  
Electric parts compartment door switch  
Specimen transfer area door switch  
Recycling circuit fan temperature switch  
Leakage breaker  
Refrigerator high-pressure switch  
Compressor thermal relay  
Compressor temperature switch  
Hot bath agitator temperature switch  
Cold bath agitator temperature switch  
Hot bath boil-dry protector  
Cold bath boil-dry protector  
Motor reverse prevention relay  
Air-pressure switch  
Overheat/ overcool protector for the hot bath (built into the controller)  
Overheat/ overcool protector for the cold bath (built into the controller)  
Low-liquid-level alarm  
Drive unit transfer time (built into the controller)  
Test area overheat/overcool protector (built into the controller)  
Overheat protector for hot bath  
Overcool protector for cold bath  
Specimen power supply control terminal  
Circuit breaker for wiring  
Fuse

## ACCESSORIES

Specimen basket (18-8 Cr-Ni stainless steel 5-mesh wire net) ..... 1  
Specimen basket cover ..... 1 set  
Fuse (in glass tube, 5 A) ..... 1  
Brine drainage hose Inner dia. : 12 mm ..... 2  
  Inner dia. : 8 mm ..... 1  
Liquid funnel ..... 1  
Liquid-charging pipe (with a rubber cap) ..... 1  
Shutter-opening hardware ..... 1  
Water absorption mat ..... 1  
User's manual ..... 1 copy



DANGER

Do not use specimens that are explosive or inflammable, or that contain such substances. Doing so may lead to fire or explosion.

Do not use as specimens substances or creatures that may emit inflammable or corrosive gases, or substances that may exceed permissible heating values.



CAUTION

Correctly clean the brine in use. Use of the incorrect liquid will significantly reduce the service life of the chamber and may produce noxious decomposition products. Before using a brine, consult with the brine manufacturer.

Be sure to read the instruction manual before operations.

## OPTIONS

### Paperless recorder

Records temperature inside the chamber. Additional inputs may also be recorded.

Number of inputs:

PL1S: 1 (5 more but turned OFF\*)

Data saving cycle: 1 sec

PL3S: 3 (3 more but turned OFF\*)

Data saving cycle: 1 sec

PL3L: 3 (3 more but turned OFF\*)

Data saving cycle: 5 sec

Temperature range: - 100 to + 220

External recording media :

CF memory card (32 MB)

\* Settings may be modified.



Paperless recorder

### Temperature recorder (Digital display)

- 100 to + 220 / 100 mm

RK-61: 1-pen

RK-63: 3-pens

RK-64: 6-dots



### For future installation of a recorder

If the user elects to prepare a custom temperature recorder or plans to add one at a later date, the necessary power cable, temperature sensor, and grounding wire are available as options.

### Thermocouple

Used to measure specimen temperature, etc.

- T JIS C 1602 with ball attached

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### Temperature recorder terminal

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Terminal for specimen temperature output

- Five terminals  
(six in total, incl. one for standard supply)



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### External alarm terminal

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If the safety device of the chamber activates, the external alarm terminal will relay the alarm to distant place.

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### Emergency stop switch

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Stops the chamber immediately.

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### Built-in air compressor

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Equipped when there is no air supply source.

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### Specimen basket

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Equivalent to standard accessory.

- Material Stainless steel (5-mesh)

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### Caster

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Installed for mobility.

- Free wheels: 4

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### Fixture for securing the body

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Used to bolt the chamber to the floor.

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### Power cord

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For connection to the primary power source.

- 5, 10m

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### Communication function

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Connected to a PC directly to control the chamber (standard equipment: RS-485).

- E-BUS
- GP-IB
- RS-232C

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### Communication cables

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- RS-485 5, 10m
- E-BUS 5, 10m
- GP-IB 2, 4m
- RS-232C 1.5, 3, 5m

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JAB Certificate Number  
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EMS Accreditation  
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**ISO 14001 (JIS Q 14001)**

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