

# TOS3200

Leakage Current Tester

**Supports touch current and protective conductor current (earth leakage current) tests**



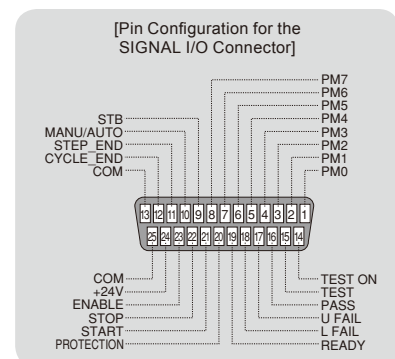
## TOS3200

**GPIB** **RS232C** **USB**

A leakage current tester has now been added to the TOS Series... Conforms to international standard IEC 60990 (“Methods of measurement of touch current and protective conductor current”).

The Leakage Current Tester TOS3200 is designed to test for leakage current (Touch Current and Protective Conductor Current) of general electrical apparatuses, excluding those used for medical purposes. With this tester, you can conduct tests conforming to various standards including IEC, UL, JIS and Electrical Appliance and Material Safety Law (Japan). You can set test conditions through simple operations on the panel because this tester holds in its memory the 51 types of test conditions for IT-related electrical equipment, electrical appliances, audio & visual equipment, lighting fixtures, power tools, and measuring and control instruments, accordingly with the standards of IEC/JIS and Electrical Appliance and Material Safety Law.

- Capable of measuring leakage current in three modes
- Eight built-in measurement circuit networks
- Up to 30 mA for RMS measurement
- Easy-to-understand operation
- Enables the continuous execution of tests
- Capable of saving test results
- 51 types of standard test conditions are preset
- Lets you manage the calibration time limit
- USB interface provided as standard



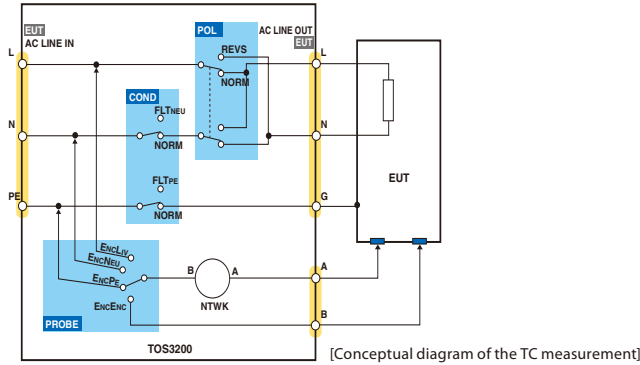
# TOS3200

## Leakage Current Tester

### Capable of measuring leakage current in three modes

#### ● Touch current (TC) operating mode\*

Enables you to measure the touch current flowing between the enclosure (accessible portion) of the electrical equipment under test (EUT) and the power line incorporating the earth wire, via Measuring Devices. For Measuring Devices, eight measurement circuit networks (NTWKs) conforming to the applicable standards are provided as standard. The switching of the polarities of the power line to the EUT, as well as single-fault conditions, are automatically set with relays inside the tester.



#### ● Protective conductor current (PCC) operating mode\*

Enables you to measure the current flowing through the protective conductor (earth wire) by connecting the power plug (NEMA5-15 or an equivalent) of an item of 100 V electrical equipment to the socket on the front panel. A multi-outlet is available as an option (sold separately) to accommodate the different plugs used around the world.

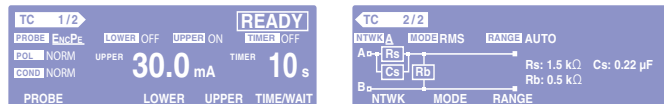
#### ● Meter (METER) operating mode

In the same way as an ordinary multimeter, enables you to measure voltage and current using measurement terminals A and B on the front panel. For voltage measurement, it offers a "safety extra low voltage" (SELV) detection function; for current measurement, it offers a measurement function using measurement circuit networks (NTWKs).

\*TC=Touch Current PCC=Protective Conductor Current

### Easy-to-understand operation

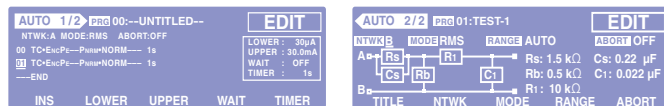
Simple operation is possible thanks to the intuitively understandable test condition menu and the function keys/rotary knobs.



[Setting screen for touch current (TC) measurement]

### Enables the continuous execution of tests

Allows you to automatically conduct TC and PCC tests as a single sequence program by setting their test conditions as up to 100 independent tests (steps). You can set up to 100 sequence programs, with up to 500 steps in total. To support automation test, measurement point (probe setting) can be switched over without turning off EUT power line.



[Setting screen for auto tests]

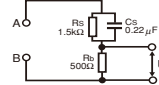
### Up to 30 mA for RMS measurement

Capable of measuring 30 μA to 30 mA for DC/RMS measurement and 50 μA to 90 mA for PEAK measurement, both in three ranges. Two range switching functions are provided, namely, a fixed range function (FIX) and auto range function (AUTO), which conform to the current to be measured. For RMS measurement, the "true root-mean-square value" is achieved.

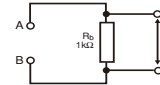
### Eight built-in measurement circuit networks

It offers built-in eight measurement circuit networks for measuring the touch current of general electrical equipment.

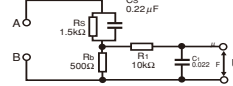
#### ● Measurement circuit network (network A) (comply with IEC60990 fig. 3 U1 measurement)



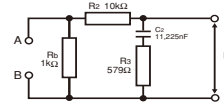
#### ● Measurement circuit network (network D) (Applicable standard: Electrical Appliance and Material Safety Law)



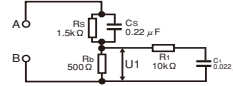
#### ● Measurement circuit network (network B) (comply with IEC60990 fig. 4 U2 measurement)



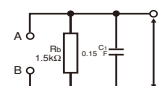
#### ● Measurement circuit network (network E) (Applicable standard: Electrical Appliance and Material Safety Law)



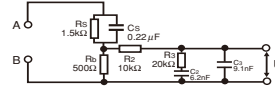
#### ● Measurement circuit network (network B1) (comply with IEC60990 fig. 4 U1 measurement)



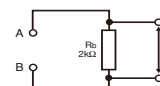
#### ● Measurement circuit network (network F) (Applicable standard: IEC61029 etc.)



#### ● Measurement circuit network (network C) (comply with IEC60990 fig. 5 U3 measurement)



#### ● Measurement circuit network (network G) (Applicable standard: IEC60745 etc.)



### Capable of saving test results

For independent tests, enables you to save not only test results but also the test date and time and the test conditions for up to 50 tests; for auto tests, you can save this data for up to 50 programs. You can also save the test results as external records using the USB and other interfaces.

### 51 types of standard test conditions are preset

The memory in the main unit is pre-written with 51 types of test conditions for general electrical equipment, which conform to IEC 60990 and the standards listed below. You can set the standard test conditions merely by calling them.

[Standards covered by the memory]

Standard No.	Applicable electrical equipment
IEC60950	Information technology equipment
IEC60335	Household and similar electrical appliances
IEC60065	Audio, video and similar electronic apparatus
IEC60745	Hand-held motor-operated electric tools
IEC60598	Luminaires
IEC61010	Electrical equipment for measurement, control, and laboratory use
Electrical Appliance and Material Safety Law	Electrical appliances
IEC61029	Transportable motor-operated electric tools

### Lets you manage the calibration time limit

For independent tests, enables you to save not only test results but also the test date and time and the test conditions for up to 50 tests; for auto tests, you can save this data for up to 50 programs. You can also save the test results as external records using the USB and other interfaces.

### USB interface provided as standard

In addition to the SIGNAL I/O, GPIB, and RS232C interfaces, a USB interface is also provided as standard.

### Range of other functions

- "MAX function," which retains the largest current measured.
- "CONV function," which converts the measured current value into the corresponding value for the preset power voltage.
- "SELV function," which causes the DANGER lamp to turn ON if a preset safety extra low voltage (SELV) is exceeded in meter measurement mode.
- "CHECK function," which performs self-analysis of the measurement circuit networks.

# TOS3200

## Leakage Current Tester

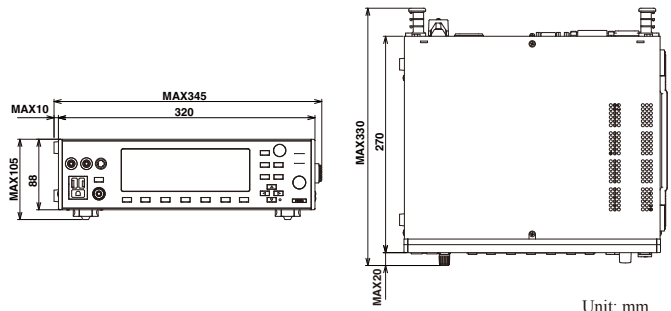
Measurement item, measurement mode		
Measurement item	3 types, namely, touch current (TC) measurement, protective conductor current (PCC) measurement, and METER	
Measurement method	TC Measure the voltage drop across the reference resistor, using a measurement circuit network (NTWK), and then calculate the current.	
	PCC Measure the voltage drop across the reference resistor connected to the protective earth wire, and then calculate the current.	
	METER Measure the voltage and current using the measurement terminals.	
Measurement mode	DC/RMS/PEAK (RMS being the true root-mean-square value)	
Measurement circuit network (NTWK)	Network A Basic measurement element: (1.5 kΩ/0.22 μF) + 500 Ω	
	Network B/B1 Basic measurement element: (1.5 kΩ/0.22 μF) + 500 Ω/(10 kW + 0.022 μF)	
	Network C Basic measurement element: (1.5 kΩ/0.22 μF) + 500 Ω/(10 kΩ + (20 kΩ + 6.2 nF)/9.1 nF)	
	Network D Basic measurement element: 1 kΩ	
	Network E Basic measurement element: 1 kΩ/(10 kΩ + 11.225 nF + 579 Ω)	
	Network F Basic measurement element: 1.5 kΩ/0.15 μF	
	Network G Basic measurement element: 2 kΩ	
Network constant tolerance	Resistance: ±0.1%, capacitor 0.15 μF: ±2%, other: ±1%	
Current measurement section		
Measurement range	Range 1 DC/RMS: 30 μA to 600 μA, PEAK: 50 μA to 850 μA (*3)	
	Range 2 DC/RMS: 125 μA to 6.00 mA, PEAK: 175 μA to 8.50 mA (*3)	
	Range 3 DC/RMS: 1.25 mA to 30.0 mA, PEAK: 1.75 mA to 90.0 mA (*3)	
Range switching	AUTO/FIX	
Measured current (i) display/resolution	i < 1 mA: □□□ mA/1 μA, 1 mA ≤ i < 10 mA: □□□ mA/0.01 mA 10 mA ≤ i < 100 mA: □□□ mA/0.1 mA	
Measurement accuracy(*5)	Range 1	DC ±(5.0% of rdng + 20 μA)
		RMS 15 Hz ≤ f ≤ 10 kHz: ±(2.0% of rdng + 8 μA) 10 kHz < f ≤ 1 MHz: ±(5.0% of rdng + 10 μA)
		PEAK 15 Hz ≤ f ≤ 10 kHz: ±(5.0% of rdng + 10 μA)
		DC ±(5.0% of rdng + 50 μA)
	Range 2	RMS 15 Hz ≤ f ≤ 10 kHz: ±(2.0% of rdng + 20 μA) 10 kHz < f ≤ 1 MHz: ±(5.0% of rdng + 20 μA)
		PEAK 15 Hz ≤ f ≤ 1 kHz: ±(2.0% of rdng + 50 μA) 1 kHz < f ≤ 10 kHz: ±(5.0% of rdng + 50 μA)
		DC ±(5.0% of rdng + 0.5 mA)
		RMS 15 Hz ≤ f ≤ 10 kHz: ±(2.0% of rdng + 0.2 mA) 10 kHz < f ≤ 1 MHz: ±(5.0% of rdng + 0.2 mA)
	Range 3	PEAK 15 Hz ≤ f ≤ 1 kHz: ±(2.0% of rdng + 0.5 mA) 1 kHz < f ≤ 10 kHz: ±(5.0% of rdng + 0.5 mA)
		DC ±(5.0% of rdng + 0.5 mA)
		RMS 15 Hz ≤ f ≤ 10 kHz: ±(2.0% of rdng + 0.2 mA) 10 kHz < f ≤ 1 MHz: ±(5.0% of rdng + 0.2 mA)
		PEAK 15 Hz ≤ f ≤ 1 kHz: ±(2.0% of rdng + 0.5 mA) 1 kHz < f ≤ 10 kHz: ±(5.0% of rdng + 0.5 mA)
Input resistance, input capacitance	1 MΩ±1%, < 200 pF	
Common mode rejection ratio	f ≤ 10 kHz: 60 dB or greater, 10 kHz < f ≤ 1 MHz: 40 dB or greater	
Judgement function		
Judgement method	Pass/fail judgement by setting upper and lower current limits in window comparator mode	
Judgement	U-FAIL for currents above the upper limit; L-FAIL for currents below the lower limit.	
Display, etc.	U-FAIL/L-FAIL/PASS display, buzzer sounding	
PASS hold	The time for which a PASS judgement is retained can be set to 0.2 s to 10.0 s or to HOLD	
Setting range	Range 1 DC/RMS: 30 μA to 600 μA, PEAK: 50 μA to 850 μA (*4)	
	Range 2 DC/RMS: 151 μA to 6.00 mA, PEAK: 213 μA to 8.50 mA (*4)	
	Range 3 DC/RMS: 1.51 mA to 30.0 mA, PEAK: 2.13 mA to 90.0 mA (*4)	
Judgement accuracy	Conforms to measurement accuracy. (Read rdng as set.)	
Measurement of voltage between A and B		
Measurement range	DC/RMS: 10.000 V to 300.0 V, PEAK: 15.000 V to 430.0 V	
Accuracy	±(3% of rdng + 2 V), measurement range fixed at AUTO	
Input impedance	Approx. 40 MΩ	
SELV detection	Set the SELV to detect; if this value is exceeded, the DANGER lamp is turned ON	
SELV setting range	10 V to 99 V, in 1-V steps, OFF function provided	
Timer, test execution function, memory		
Timer	Test wait time Setting range: 0 s to 999 s, accuracy: ±(100 ppm of set + 20 ms)	
	Test time Setting range: 1 s to 999 s/OFF function, accuracy: ±(100 ppm of set + 20 ms)	
Text execution	Auto test (AUTO): Automatic execution of up to 100 steps (test conditions) Independent test (MANUAL): Independent execution of TC, PCC, or METER measurement	
Memory	Test conditions AUTO: Up to 100 sequence programs can be saved (up to 500 steps in total). MANUAL: Up to 100 sequence programs can be saved.	
	Test results The user can select whether to save the judgement results when they are output at the end of the tests. AUTO: Test results for up to 50 programs can be recorded. MANUAL: Test results for up to 50 tests can be recorded.	

- \* The warm-up time must be 30 minutes or longer.
- \* rdng denotes a reading, set denotes the set value, and EUT is the electrical equipment under test.

- \*1: May not apply to custom-made or modified products.
- \*2: Limited to products with CE marking on their panels.
- \*3: The maximum range is indicated. The range differs depending on the measurement circuit network.
- \*4: The maximum range is indicated. The range differs depending on the measurement circuit network. Also, the UPPER setting in each range when the FIX range is selected is indicated.
- \*5: Current converted value in Network A,B,C and PCC measurement, based on built-in voltmeter accuracy.

Other functions		
Measured value conversion (CONV)	Converts the measured current value into the corresponding value at the preset power voltage Setting range: 80.0 V to 300.0 V, OFF function provided	
MEASURE MODE	Selects a measured value from those below	
	NORM: Displays the measured value in the measurement period	
	MAX: Displays the largest measured value in the measurement period	
Power positive/negative phase selection (POL)	NORM: Positive phase connection, REVS: Negative phase connection	
Single fault selection (COND)	NORM: Normal, FLTNEU: Disconnection of the neutral wire, FLTPE: Disconnection of the protective earth wire	
Earth check	Generates CONTACTFAIL if the enclosure is grounded in a TC (EnCliv, EncNeu) test	
MEASURE CHECK	Checks the measurement function between measurement terminals A and B, and places the tester in the PROTECTION state if an error is detected	
Voltage measurement(EUT)	Measurement range: 80.0 V to 250.0 V, resolution: 0.1 V, accuracy: ±(3% of rdng + 1 V)	
Current measurement(EUT)	Measurement range: 0.1 A to 15.00 A, resolution: 0.01 A, accuracy: ±(5% of rdng + 30 mA)	
Power measurement (effective power)	Measurement range: 10 W to 1500 W Accuracy (at a power voltage of 80 V or higher and a load power factor of 1): ±(5% of rdng + 8 W) Items: Calibration date and time, test date and time, permissible date and time: Up to 2099	
System clock	Recording Enables the setting of a calibration time limit. Once this time has passed, a warning is output at power on	
	Calibration time limit management(CAL PROTECT) ON: Places the tester in the PROTECTION state (disables the use of the tester), OFF: Displays warning.	
Protective operation	Relay operation error, overload, over range, measurement function check, failure of internal battery, etc.	
Interface		
RS232C	D-Sub 9-pin connector (conforming to EIA-232D), baud rate: 9600/19200/38400 bps (For connection to a PC, use a "9-pin female-female reverse" cable.)	
GPIO	Conforms to IEEE Std. 488-1978 (SH1,AH1,T6,TE0,L4,LE0,SR1,PP0,DC1,DT0,CO,E1)	
USB	USB Specification 2.0	
REMOTE	6-pin MINIDIN connector (for HP21-TOS (separately sold option) only)	
SIGNAL I/O	25-pin D-Sub connector	
General		
Measurement terminals	Rated voltage/current	Terminals A to B: 250 V, terminal to chassis: 250 V, 100 mA
	Measurement category	CAT II
Environment	Effective terminal display	Terminals effective to measurement are indicated with LED lamps.
	Specification assured range	Temperature: 5°C to 35°C, humidity: 20% rh to 80% rh (no condensation)
	Operating range	Temperature: 0°C to 40°C, humidity: 20% rh to 80% rh (no condensation)
	Storage range	Temperature: -20°C to 70°C, humidity: 90% rh or less (no condensation)
Power	Mounting location	Indoors, altitude of 2000 m or less
	Input power for EUT	Nominal input rating: 100Vac to 240Vac, 50/60Hz Nominal input rating: 100Vac to 240Vac, 50/60Hz, power consumption: 70 VA max. Rated output capacity: 1500 VA, maximum current: 15 A, rush current: 70 A peak max. (within 20 ms)
Insulation resistance	30 MΩ or greater (500 Vdc) (between AC line and chassis, between measurement terminal and chassis)	
Withstand voltage	1390 Vac, 2 seconds/20 mA or less (between AC line and chassis)	
Ground bond	25 Aac/0.1 Ω or less	
Safety (*1)	Conforms to the requirements of the directive and standard below. Low Voltage Directive 2014/35/EU, EN61010-1 (Class I, Pollution degree 2)	
Electromagnetic compatibility (*1, *2)	Conforms to the requirements of the directive and standard below. EMC Directive 2014/30/EU, EN 61326-1 (Class A), EN 55011 (Class A, Group 1), EN61000-3-2, EN61000-3-3, Applicable conditions: All cables and wires used to connect to this product must be shorter than 3 meters. Use the supplied test leads.	
Outside dimensions, weight	320[12.60 inch] (345[13.58 inch]) W × 88[3.46 inch] (105[4.13 inch]) H × 270[10.63 inch] (335[13.19 inch]) D mm, approx. 5 kg(approx. 11.02 lbs)	
Accessories	1 set of test leads (TL21-TOS: red and black, one each, with alligator clips) 1 flat probe (FP01-TOS), 1 spare fuse (15 A, for EUT power) 1 instruction manual, 1 circuit principle diagram sticker 2 power cords (for the tester and for the EUT AC line)	

### External dimensional diagrams



## Test Lead

### ■ TL01-TOS

[cable length: 1.5 m/max. operating voltage: 5 kV]



### ■ TL02-TOS

[cable length: 3 m/max. operating voltage: 5 kV]



### ■ TL03-TOS

[cable length: 1.5 m/max. operating voltage: 10 kV]



### ■ TL04-TOS

[cable length: 1.5 m/max. operating voltage: 5 kV  
(for TOS1200, RL01-TOS)]



### ■ TL05-TOS

[cable length: 1.5 m/max. operating voltage: 5 kV  
(for 149-10A, RL01-TOS)]



### ■ TL06-TOS

[cable length: 0.5 m/max. operating voltage: 5 kV  
(for parallel connection of TOS9220/9221)]



### ■ TL07-TOS

[cable length: 1.5 m/max. operating voltage: 5 kV  
(for TOS9220/9221)]



### ■ TL08-TOS

[cable length: 1.5 m/max. operating voltage: 1 kV  
(for TOS7200)]



### ■ TL11-TOS

[cable length: 1.5 m/max. operating current: 30 A  
(for TOS6200A)]



### ■ TL12-TOS

[cable length: 1.5 m/max. operating current: 60 A  
(for TOS6210)]



### ■ TL13-TOS

[cable length: 1.6 m/max. operating current: 40 A  
(for TOS9302, 9303, 9303LC)]



### ■ TL21-TOS

[cable length: 1.5 m (for TOS3200)]



### ■ TL22-TOS

[cable length: 1.7 m/max. rated voltage: 1000 V  
/max. rated current: 10 A (for TOS9303LC)]



### ■ TL31-TOS

[cable length: 1.5 m/max. operating voltage: 5 kV  
(for TOS5300 Series)]



### ■ TL32-TOS

[cable length: 3 m/max. operating voltage: 5 kV  
(for TOS5300 Series)]



### ■ TL33-TOS

[cable length: 0.5 m/max. operating voltage: 5 kV  
(for TOS9320)]



### ■ TL51-TOS

[cable length: 1.5 m (for TOS7210S)]



### ■ HTL-2.5DH

[cable length: 1.5 m/max. operating voltage: 10 kV  
(for 149-10A)]



## Test Probe

### ■ HP01A-TOS\*

[cable length: 1.8 m/max. operating voltage: 4 kV  
AC(RMS), 5kV DC]

### ■ HP02A-TOS\*

[cable length: 3.5 m/max. operating voltage: 4 kV  
AC(RMS), 5kV DC]

\* The optional Adaptor DD-5P/9P is required for the connection.



### ■ HP11-TOS

[cable length: 1.8 m/max. operating voltage: 1 kV DC/  
max. operating current: 100 mA]



### ■ HP21-TOS

[cable length: 1.8 m/max. operating voltage: 250 Vrms/  
max. operating current: 100 mA]



### ■ LP01-TOS

[cable length: 2 m/max. operating current: 30 A]



### ■ LP02-TOS

[cable length: 2 m/max. operating current: 60 A]



### ■ FP01-TOS

(flat probe for TOS3200, TOS9303LC)



# Option

## Remote Control Box

### RC01-TOS\*

[one-hand operation/dimensions: 200W×70H×39D mm]  
Accessory cable length: 1.5 m

### RC02-TOS\*

[both-hands operation/dimensions: 330W×70H×39D mm]  
Accessory cable length: 1.5 m



\* The optional Adaptor DD-5P/6P is required for the connection.

## Warning Light Unit

### PL01-TOS (for 100 V AC)



### PL02-TOS (for 24 V DC)



## Buzzer Unit

### BZ01-TOS (for 100 V AC)

\* This can not be used with TOS9200/9201, TOS7200



## DIN Cable

### DD-3 5P

[cable length: 3 m/DIN plug to DIN plug]



## Conversion Cable

### DD-5P/6P

[Adapter /DIN to Mini DIN]



### DD-5P/9P

[Adapter /DIN to Mini DIN]



The DD-5P/9P DIN adapter cable (5 pin to 9 pin) is for connecting the following option products to the TOS9300/TOS5300/TOS5200 series.

- Remote control box (RC01-TOS/RC02-TOS)
- High voltage test probe (HP01A-TOS/HP02A-TOS)
- Test probe for touch current test (HP21-TOS)

## Multi Outlet

### OT01-TOS (multi outlet for TOS3200)



## Terminal Unit

### TU01-TOS (for TOS5300/TOS5200 Series)



This is a terminal unit for converting a 25-pin SIGNAL I/O connector of TOS5300/5301/5302/5200 to a 14-pin SIGNAL I/O connector of TOS5050A/5051A.

By connecting via this product, the external control performed with TOS5050A/5051A can be performed with TOS5300/5301/5302/5200 at the same time.

## Cross Reference of options for Electrical Safety Testers

Model	Remote Control		Warning Light Unit, Buzzer Unit, Terminal Unit				Test Probe					Test Lead															
	RC01/02-TOS	DD-3 5P	PL01-TOS	PL02-TOS	BZ01-TOS	TU01-TOS	HP01A/02A-TOS	HP11-TOS	HP21-TOS	LP01-TOS	LP02-TOS	FP01-TOS	TL01/02/03-TOS	TL04-TOS	TL05-TOS	TL06-TOS	TL07-TOS	TL08-TOS	TL11/12-TOS	TL13-TOS	TL21-TOS	TL22-TOS	TL31/32-TOS	TL33-TOS	TL51-TOS	HTL2.5-DH	
TOS9300	○			○			○																	○	○		
TOS9301	○			○			○																	○	○		
TOS9301PD	○			○			○																	○	○		
TOS9302	○			○			○													○				○	○		
TOS9303	○			○			○													○				○	○		
TOS9303LC	○			○			○		○		○									○		○		○	○		
TOS9320																	○							○	○		
TOS9213AS	○	○		○			○						○	○		○											
TOS5101	○	○	○		○								○														
TOS5302	○			○		○	○																	○			
TOS5301	○			○		○	○																	○			
TOS5300	○			○		○	○																	○			
TOS5200	○			○		○	○																	○			
TOS6200A	○	○								○	○									○							
TOS6210	○	○								○	○									○							
TOS7200	○							○										○									
TOS7210S	○	○																								○	
TOS3200									○			○										○					
TOS8030	○	○		○			○						○														
TOS1200														○			○										
149-10A															○												○
RL01-TOS														○	○	○											

○ : Required the converting adapter "DD-5p/6p"    ○ : Allows to use within the cable rating    ○ : Required the converting adapter "DD-5p/9p"