PRÜFEINRICHTUNGEN TEST EQUIPMENT
PTL Dr. Grabenhorst GmbH
DE-95343 Stadtsteinach P.O. BOX 12 53

Company portrait

Company's History

PTL is a continuation of an electrical workshop founded in **1947** in Bamberg by Master Engineer Georg Müller under the name PHYS.-TECHN. LABOR. In the course of time, test equipment took a dominating role in the manufacturing programme.

In **1965**, the domicile was transferred to Stadtsteinach. The company was taken over aftet the death of the founder in **1974** by Dr.-Ing. Dieter Grabenhorst. Since the 1st of January **1984**, the registered name is **PTL Dr. Grabenhorst GmbH**. In **1986** the buildings were acquired and enlarged, where PTL is accommodated today.

The following years stood out for continuous expanding on the areas quality assurance, product and production improvement as well as international partnerships.

Dr. Grabenhorst retired end of **2005** and his son Juergen Grabenhorst took over the company. In September **2007** anniversary "**60 Years of PTL**" was celebrated.

PTL's Manufacturing Programme

Apart from products made to specification, today's programme comprises these fundamental groups:

- **mechanical strength**: test equipment to demonstrate the level of robustness, the durability, the impact strength as well as the resistance against wear, harmful effects and deformation
- test equipment to prove the **degrees of protection** provided by enclosures (IP Code)
- **electrical safety**, comprising e.g. test equipment for surge test, gauges for creepage and air distances, temperature measuring equipment
- **breaking capacity** and **behaviour in normal use** of switches as well as plugs and socket-outlets, being actuated by test units while subjected to electrical load
- **resistance to heat and fire**: test equipment for plastics to verify the fire resistance, the resistance to tracking and to deformation, when subjected to heat
- test equipment for **cables**, **plugs**, **socket-outlets** concerning e.g. cord anchorage, flexibility, behaviour when subjected to high or low temperatures and abrasion resistance
- **testing of insulating materials**: test equipment concerning characteristics of raw materials

Our products enable testing which are stated in different standards and publications. The most important are:

the publikations of the **International Electrotechnical Commission** (**IEC**),

the European standards accepted by the **Comité Européen de Normalisation Electrotechnique** (**CENELEC**, **EN**),

the standards of the **German Institute for Standardisation** (**DIN**),

the regulations of the **Association for Electrical, Electronic & Information Technologies** (**VDE**),

as well al comparable standards and regulations of all nations.

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Company portrait (continuation)

Aim and purpose of PTL Test Equipment

By means of PTL testing equipment proof can be furnished, that products and prefabricated items meet the required standards concerning safety, suitability and reliability. Therefore, quality and testing laboratories would be unthinkable without our test equipment.

Constantly rising prices effect that the following question gains more and more emphasis:

"How can be technical safety and high-quality standards maintained, even if materials and working hours are economized?"

The PTL test equipment is at your disposal for the objective answer on those questions.

PTL product information

Since we are addressing ourselves to the respective specialists, we have, in our prospectuses, maintained the sober language of technicians, free from customary superlatives.

PTL product information is available in English and German language as printed prospectuses and as PDF-files.

There is an individual prospectus on every product or product family.

At top of the prospectus is stated for which test objects and test criteria the respective PTL test equipment is suitable.

In the following there is pointed at the relevant regulations. In the main part, the standard outfit and the design are defined in detail.

For a lot of standards we can make product schedules available. These schedules give a survey concerning the tests pointed out in the respective standard, which can be performed by means of the PTL test equipment.

The Customers

Among our customers are e.g. testing institutes for electrical safety and accident research, for industrial supervision, Technical Control Boards as well as the electrical industry and the plastics industry. PTL has customers in almost all regions in the world. In the following countries we are already represented:

Algerie	Belgium	China	Czech Rep.	Greece
Great Britain	Hong Kong	Hungary	India	Indonesia
Israel	Italy	Japan	Korea	Luxembourg
Malaysia	Morocco	Netherlands	Pakistan	Singapore
Slovakia	Spain	South Afrika	Taiwan	Thailand
	Tunisia	Turkey	Vietnam	

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PTL - Test Equipments

Mechanical strength

Protection against dust, water and accidental contact

Electrical safety

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PTL - Test Equipments (continuation)

Breaking capacity and behaviour in normal use

Resistance to heat and to fire

Cables, plugs, socket-outlets and couplers

Testing of insulating materials

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PTL - Tumbling Barrel Test Machine 50

to determine the mechanical strength of electrical appliances or electrical components

according to **IEC 60068-2-31** :2008-05 § 5.3.2, 5.3.3 and An. A, Fig. A.1.

Standard outfit:

1 barrel, consisting of a bearing-mounted middle segment, 2 intermediate segments of 250 mm height, and 2 bottom segments, internal length of the chute 275 mm, internal width of the chute 275 mm, bottoms made of 19 mm thick wood, with removable steel sheets of 3 mm thickness, including a charging door, internal height 1 175 mm, **height of fall 1 000 mm**, by removing the intermediate segments convertible to internal height 675 mm and **height of fall 500 mm**,

1 frame with barrel support,

1 drive unit with AC geared motor, to drive the barrel at 5 rpm, with slip friction clutch as protection in case of accidental contact,

1 switching and monitoring unit with fuses, protecting switch for the motor, preset able counter to indicate the number of falls and to switch off the unit.

Design:

steel construction, varnished papyrus-white structured, barrel corpus of stainless steel sheet, varnished stone-grey structured, some steel parts black-oxide-finished, for connection to 230 V AC 50 Hz, other voltages on request.

Article No. F 06.50

▪ **Alternatively:**

Tumbling Barrel Test Machine 15

Similar to F 06.50 however with one segment barrel of internal height 675 mm and **height of fall 500 mm**.

Article No. F 06.15

▪ **Special model:**

Tumbling Barrel Test Machine 30

to determine the mechanical strength of accessories for vacuum cleaners, according to IEC 60312, similar to F 06.15 however of larger dimensions, total height of the barrel approx. 1 070 mm, **height of fall 800 mm**.

on request

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PTL - Cord Anchorage Torque Device

for testing the resistance to torque of cord anchorages at electrical appliances provided with non-detachable flexible cords with a diameter up to 10 mm and torques up to 0.5 Nm

according to

IEC 60238 :2011-06 § 12.6 Tab. 6; **IEC 60320-1** :2007-11 § 22.3,
IEC 60335-1 :2010-05 § 25.15 Tab. 12; **IEC 60884-1** :2013-02 § 23.2 Tab. 18,
DIN VDE 0620-1 :2010-02 § 23.2 Tab. 18.

Standard outfit:

1 hollow shaft, internal diameter 10 mm, bearing-mounted, smoothly rotatable and slidable, with drill chuck, rope wheel and crank handle,
1 bearing appliance consisting of two needle bearings and a thrust bearing,
1 compression spring for spring forces between 7.5 N and 10 N in its end positions,
1 fastening device for the specimens, adjustable, with easily removable plate for plugs with pin distance 19 mm,
1 set of loading weights to produce the torques from 0.05 Nm to 0.5 Nm in steps of 0.025 Nm,
1 base plate, dimensions approx. 500 mm x 160 mm.

Design:

Base plate of anodized aluminium, bearing appliance, fastening device and other parts black-oxide-finished or of stainless steel, total length approx. 600 mm, height approx. 160 mm.

Article No. **F 20.12**

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PTL - Spring-operated Impact-test Apparatuses

for impact tests to demonstrate the level of robustness

according to **IEC 60068-2-75** :1997-08 and further national standards worldwide.

Universal Impact-test Hammer 50

with 0.20 J - 0.35 J - 0.50 J - 0.70 J - 1.00 J, five selectable impact energies.

Standard outfit:

1 body, including release mechanism and striking element guide, mass 1250 g, outside diameter 50 mm,
1 striking element, with cocking knob and hammer head, face of polyamide, spherical segment shape with a radius of 10 mm, mass 250 g, length approx. 315 mm,
1 release cone, mass 60 g,
1 helical compression spring, mass appr. 9 g,
1 disk with knurled edge to select the impact energy.

Total length cocked approx. 350 mm, total mass approx. 1 570 g.

Supplied in case of plastics, ready for operation, including PTL work certificate concerning calibration of the five impact energies by means of a calibration device.

Article No.	F 22.50

Impact-test Hammer 1x as Special-Type

as described above, however with only one fixed impact energy:

Impact energy	Tolerance	Article No.
0.14 J	± 0.014 J	F 22.10
0.20 J	± 0.020 J	F 22.11
0.35 J	± 0.035 J	F 22.15
0.50 J	± 0.050 J	F 22.16
0.70 J	± 0.070 J	F 22.17
1.00 J	± 0.100 J	F 22.18

Impact-test Hammer 20

as described above, however as Special Type with one fixed impact energy 2.0 J, tolerance of impact energy ± 0.1 J, striking element with spherical segment shaped striking piece of iron, radius 25 mm, total mass of striking element 500 g, total mass of apparatus 3 630 g.

Article No.	F 22.20

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PTL - Contact Pressure Measuring Device

to determine the contact pressure of side earthing contacts of two-pole socket-outlets 10/16 A 250 V

according to **DIN VDE 0620-1** :2013-03 § 18.1 and 21; Fig. 14.

Standard outfit:

1 body, milled of steel, with marks for indication of the distance 16 mm between lever bale and median line of the body,

2 levers, pivoted in the body, lower ends barreled, upper ends with eyelets for the wire bow and with marks,

1 wire bow to hook into the eyelets of the levers, with eyelet for fastening the force indicator,

1 fixing screw, with 4 spring loaded pins to secure the device in the specimen,

2 knurled screws to separate the lever bales for 48 hours-test.

Design:

Body black-oxide-finished, levers partially hardened and black-oxide-finished, other parts black-oxide-finished or of stainless steel.

Article No. F 26.10

▪ Accessory:

Force Indicator

designed as a spring loaded pull dynamometer, for measuring tractive forces up to 10 N.

Article No. F 26.31

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PTL - Electric Iron Drop Test Machine 13

to check the mechanical strenght of electric irons by repeated drop

according to **IEC 60335-2-3** :2012-03 § 21.101.

Standard outfit:

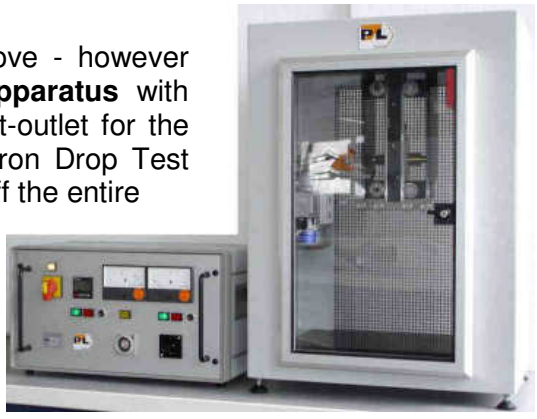
1 housing with basic frame, door with pane of polycarbonate and with safety door contact in the front, firmly fitted perforated sheet in the rear with opening for the mains connection cord of the iron,
1 steel plate, at least 15 mm thick, mass at least 15 kg, rigidly supported,
1 lifting device with radial cam for a slow lifting of the specimen for 40 mm, for a sudden release for a free fall and for a rest time on the steel plate of about 15 % of the cycle duration,
1 gear motor, to drive the lifting device, for 20 drops per minute maximum,
1 falling assembly, with tie-bar for fastening the specimen, with 1 pair of distance pieces 40 mm,
1 switchgear, with main switch, fuses and preset counter to switch off the unit after the preset number of drops.

Design:

Housing as weldment, papyrus-white structure varnished, steel plate ground, smaller parts black-oxide-finished or of stainless steel, base 500 mm x 340 mm, height approx. 720 mm, for connection to 230 V AC 50 Hz, other voltages on request.

Article No. F 28.13

Electric Iron Drop Test Unit 23



Consisting of **Electric Iron Drop Test Device** as above - however without switchgear, and **Electric Iron Monitoring Apparatus** with voltmeter 250 V, current meter 10 A, fuses and socket-outlet for the specimen, with integrated switchgear for the Electric Iron Drop Test Machine, current / time lag relay combination to switch off the entire test unit if the current is smaller than 1 A for a longer period than set, maximum setting time 10 minutes, automatic cut-off to switch off the entire test unit in case of a short circuit in the specimen, too.

Design:

as above, Monitoring Apparatus as19" plug-in unit with front panel of aluminium, in a portable housing, papyrus-white structure varnished, for connection to 230 V AC 50 Hz.

Article No. F 28.23

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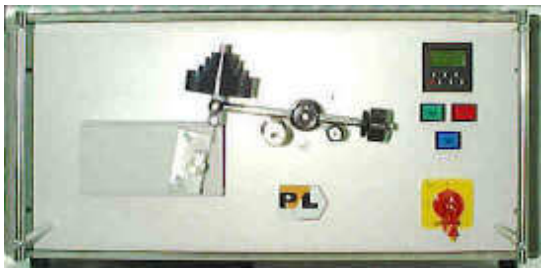
PTL - Plug Pin Abrasion Test Machine 16

to determine the abrasion resistance of insulating sleeves of plug pins by moving backwards and forwards

according to **IEC 60884-1** :2013-02 § 24.7 und 30.2 Fig. 28,
EN 50075 :1990-07 § 13.3 Fig. 9,
DIN VDE 0620-1 :2010-02 § 24.7, 30.2, Fig. 29.

Standard outfit:



1 carrier, stroke 9 mm ± 0.2 mm, with support for clamping the specimens with plug pin inclined 10° to the horizontal,
1 eccentric drive unit with geared motor, for 30 (-5) movements of the carrier per minute,
1 beam, with scraping head, including holding device for the steel wire, with adjustable counterweight,
1 set of weights, for loading forces up to 5 N in steps of 0.1 N,
10 steel wires, diameter 1 mm ± 0.02 mm, bent into a rectangular U-shape, base of the U being for 6 mm length straight,
1 electrical predetermining counter, 5-digit, resettable, indicating the number of strokes,
1 electric control device, with automatic disconnection of the motor when reaching the predetermined number of strokes, with push-button for inching with the object of setting,
1 eccentric disc for lifting the scraping head.

Article No. F 36.16

Design:

Steel sheet housing, system 19", sprayed with papyrus-white structure varnish, width approx. 510 mm, height approx. 210 mm, depth approx. 300 mm, some steel parts black-oxide-finished, aluminium parts anodized, for connection to 230 V AC 50 Hz.

▪ Alternatively:

Plug Pin Abrasion Test Machine 36

Similar to F 36.16, however for 3 specimens, with 3 geared motors, 3 predetermining counters, 3 electric control devices and 3 carriers with specimen supports, 3 beams and 3 sets of weights, width approx. 510 mm, height approx. 570 mm, depth approx. 400 mm.

Article No. F 36.36

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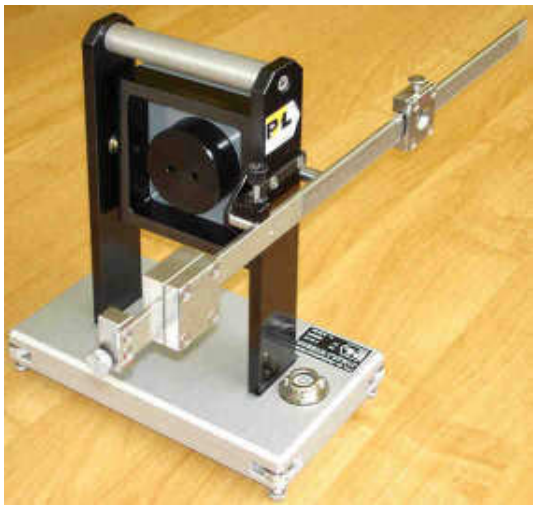
PTL - Socket-outlet Torque Balance

for measuring and testing the torque strain exerted by appliances with plug pins on socket-outlets

according to	**IEC 60065** :2011-02 § 15.4.1 Fig. 11;	**IEC 60335-1** :2010-05 § 22.3;
	IEC 60884-1 :2013-02 §14.23.2;	**IEC 60950-1** :2013-05 § 4.3.6;
	DIN VDE 0620-1 :2010-02 § 14.23.2.	

Standard outfit:



1 testing socket-outlet replica “Euro”, two-pole, without earth contacts and without protecting rim,
1 testing socket-outlet replica “Schuko”,
1 frame for the socket-outlet, pivoted around a horizontal axis through the centre lines of the contact tubes, pivot 8 mm behind the engagement face of the socket-outlet,
1 balance beam, with scale 0 to 0.30 m, rigidly connected with the frame for the socket-outlet,
1 sliding weight, 1 N, lockable, for torques from 0 Nm to 0.30 Nm,
1 counterweight, with screw for fine adjustment, for adjusting the balance beam,
1 stop for the balance beam, adjustable and arrest able,
1 trestle with 2 ball bearings and with crossbeam, mounted on a base plate, base plate with adjustable feet and box spirit level.

Design:

Base plate of anodized aluminium, trestle parts black-oxide-finished, balance beam and further parts of stainless steel, base plate approx. 230 mm x 120 mm, balance beam approx. 450 mm, total height approx. 240 mm.

Article No. **F 37.16**

▪ Accessories:

Socket-outlet Replicas

Australia I	AS/NZS 3112	250 V / 10 A	3 pol	F 37.31
Australia II	AS/NZS 3112	250 V / 15 A	3 pol	F 37.32
UK I	BS 1363	250 V / 13 A	3 pol	F 37.33
UK IIIa	BS 546	250 V / 2 A	3 pol	F 37.35
US I	NEMA 1-15R	125 V / 15 A	2 pol	F 37.51
US II	NEMA 5-15R	125 V / 15 A	3 pol	F 37.52
US III	NEMA 5-20R	125 V / 20 A	3 pol	F 37.53
US IV	NEMA 6-15R	250 V / 15 A	3 pol	F 37.54
US V	NEMA 6-20R	250 V / 20 A	3 pol	F 37.55

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PTL - Flexing Test Swivel Machine

for continuous bending tests by swivelling movements to check cables or cords fitted with plugs or entries from electric tools and from hand lamps

according to

IEC 60884-1 :2013-02 § 23.4 Fig. 21,
IEC 60227-2 :2003-04 § 3.2 Fig. 2 (for continuous bending test on flexible cords or cables).

Flexing Test Swivel Machine 41

for mechanical tests of 1 or 2 samples, swivel angle changeable to ±22.5°, ±45° and ±90°, swivel frequency adjustable from 0.3 Hz to 1 Hz.

Standard outfit:

1 rigid Housing, made as weldment of steel profiles and rectangular steel tubes with metal sheet covering, and protective window with safety switch inside to cover the swivel angle adjustment and the connecting rod,

1 Chassis to accommodate the control unit, with front panel, with the components: Main switch with EMERGENCY STOP function, pilot lamp for mains voltage on, fuses for the control unit and for the drive motor, frequency indicating instrument and rotary knob, predetermining counter, 6 digits, start and stop push-buttons and switch "Inching" for setting the swivel head,

1 Drive unit for the swivelling movement with geared motor, gearwheel with slip friction clutch, reduction gearwheel, crank disk with set bores to set the swivel angles, connecting rod with 2 bearing heads, transmission shaft and hollow output shaft with welded flange to fix the swivel head or other adapters,

1 Slide unit, with spindle for fine adjustment of the height and with 2 clamp bars for coarse height adjustment, can be mounted at a turn of 90°, too,

1 Swivel head, mounted on the support of the slide unit, with swivel main plate, with 2 bushings, for carrying the adapters F 39.7X and with 2 fitting plates for right angle plugs, with arresting pins for arresting the bushings at two positions, which are turned by 90°,

1 Guidance for the samples, metal plate with elongated holes as guides, with 4 distance rods for distance of 250 mm underneath the swivelling axis, convertible to 300 mm, and 2 frames,

2 sets of Loading weights, for sample loads from 5 N to 60 N, that means from approx. 0.5 kg to approx. 6.0 kg, with each 1 weight carrier 5 N with clamping kit, 1 weight piece 5 N, 1 weight piece 10 N and 2 weight pieces 20 N, weights can be easily added or removed by means of threads.

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PTL - Flexing Test Swivel Machine (continuation)

Design:

Floor type housing, of sheet steel, papyrus-white structure varnished, swivel head mainly of anodized aluminium, weights and parts of the swivelling gear black-oxide-finished, small parts black-oxide-finished or of stainless steel, for connection to 230 V AC 50 Hz.

Article No. F 39.41

▪ **Alternatively:**

Flexing Test Swivel Machine 44 and 46

for mechanical tests as F 39.41 and with equipment to load the samples with current

for 1 sample or 2 samples connected in series, by low voltage, current of the loaded conductors adjustable together from 0.5...16 A (F 39.44) resp. 0.5...32 A (F 39.46), voltage between the conductors = mains voltage,

with monitoring unit to switch off the test machine and to indicate faults in the case of short circuit or break in the loaded conductors and in the additional slightly loaded conductors, fault indication without possibility to recognize, in which of the samples the fault occurs,

mounted into the housing, fitted with a two wing protective cabinet with safety switches inside,

connection of one sample to each one set of terminals in the lower part of the housing and at the swivel head. Connection of two samples to two terminal sets in the lower part of the housing, and by bridging at the swivel head.

No. of current loaded conduct.	Voltage btw. curr. loaded conductors	Additional slightly loaded conductor	For connection to (main voltage)	Article No.
2	230 V	changeable: 0 or 1	230 V AC 50 Hz	F 39.44
2 oder 3	230 V 3 x 400 V	changeable: 0 or 1 and 0, 1 or 2	3 x 400 V AC 50 Hz	F 39.46

▪ **Accessories:**

Plug Adapter *to take up one plug with side earthing contacts according to CEE 7 Standard Sheet IV.*

Article No. F 39.71

Connector Adapter *to take up one connector according to IEC 60320-1 Standard Sheet C7.*

Article No. F 39.73

Other adapters for plugs, connectors, couplers and so on: ***on request***

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PRÜFEINRICHTUNGEN TEST EQUIPMENT
PTL Dr. Grabenhorst GmbH
DE-95343 Stadtsteinach P.O. BOX 12 53

PTL - Pendulum Impact-test Apparatus

to test the mechanical strength with impact energies of 0,14 J up to 1,0 J

according to **IEC 60068-2-75** :1997-08 § 4.2 Tab. 1 and Tab. 2, similar Annex D,

Striking element according to Table 1, Ø 18.5 mm, equivalent mass 0.25 kg, impact energies and heights of fall according to Table 2.

Standard outfit:

1 tubular pendulum arm of steel, external diameter 9 mm, wall thickness 0.5 mm, pendulum length 1 000 mm ± 1 mm effective,

1 striking element, mass 200 g, spherical segment-shaped polyamide insert R 10 mm, 85 ≤ HRR ≤ 100 Rockwell hardness,

1 base frame, height 1 270 mm, width 200 mm, with bores for screws for mounting on a wall,

1 extension arm, vertically adjustable, with horizontally adjustable pendulum pivot,

1 extension arm, vertically adjustable, with release mechanism for the pendulum, scale for height of fall horizontally adjustable,

1 Mounting Fixture according to IEC 60068-2-75 :1997-08 Annex D Fig. D.3, with steel block 175 mm x 210 mm x 35 mm, mass 10 kg, turn able around its vertical axis and to be clamped with tommy screws, sheet of plywood 175 mm x 175 mm x 8 mm, in clamping rails moveable to the sides and to be turned in steps of 90° around its central axis rectangular to the sheet of plywood.

Design:

Base frame papyrus-white structure varnished, steel parts black-oxide-finished or made of stainless steel.

Article No. F 40.25

▪ Accessory:

Mounting Block

similar to IEC 60068-2-75 :1997-08 Annex D Fig. D.4,

for testing flush-type specimens, made of beech 125 mm x 125 mm x 50 mm, with through bore diameter 65 mm, on plywood sheet 175 mm x 175 mm x 8 mm.

Article No. F 40.63

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PRÜFEINRICHTUNGEN TEST EQUIPMENT
PTL Dr. Grabenhorst GmbH
DE-95343 Stadtsteinach P.O. BOX 12 53

PTL - Flexibility Test Machine

for checking the mechanical durability of flexible cords and cables by bending them back and forth

according to **IEC 60065** :2011-02 § 16.3b [a] Tab. 19,
IEC 60227-2 :2003-04 § 3.1.2 Tab. 1, Fig. 1,
IEC 60245-2 :1998-04 § 3.1.2 Tab. 1, Fig. 1,
VDE 0472-603 :1989-07 § 4.8 Tab. 2, 3, 4; § 4.12 Tab. 6, Fig. 5.

[a] *A high-voltage supply, however belongs neither to the standard outfit nor is it available as special outfit.*

Standard outfit:

1 carrier, with recirculating-ball bearing bushes running below the table-board on two cylindrical guide ways, with mounted travelling boom,
1 geared motor with chain and connecting rod to drive the carrier with a speed 0.33 m/s ± 5%,
2 supports for the side pulleys, with grooves for the adjustment of the pulleys,
1 set of bolts nuts and ball bearings for fastening the pulleys,
1 set of loading weights, details see F 43/2,
1 set of restraining clamps as stops to limit the travel of the sample,
1 set of terminals for connection of the samples,
1 base, with two side doors, with splited table-board, with shelf for accessories,
1 protecting hood with panes of polycarbonate glass, frame of aluminium, with electric drive to open and to close,
3 door contact switches for the side doors and for the protecting hood,
1 electrical current load unit, details see F 43/2,
1 electrical switching and control unit with main switch, lockable EMERGENCY STOP switch, preset counter as well as push buttons I and O.

Design:

Steel construction, papyrus-white structure varnished with stone grey highlights, smaller parts black-oxide-finished, cylindrical guide ways hardened and ground,
for operation at 3 x 400 V 50 Hz or 60 Hz.

Article No. **F 43.11**

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PRÜFEINRICHTUNGEN TEST EQUIPMENT
PTL Dr. Grabenhorst GmbH
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PTL - Flexibility Test Machine (continuation)

further outfit for Flexibility test machine

Electrical current load unit

The sample is loaded by extra-low voltage, the current is adjustable 1…20 A resp. 1...32 A, the voltage between the leads is equal to the mains voltage and selectable, 230 V or 400 V, two or three phases. Additionally monitored are 1 or 2 leads.

The monitoring unit switches off the drive and the load unit in case of short circuit or breakage in the loaded and unloaded leads of the sample.

Switching and control units: digital current indicating instrument, rotary switch "CONDUCTOR AMPERAGE" to select the conductor, the current of which is indicated, rotary switch "NUMBER OF MONITORED CONDUCTORS" to select the quantity of conductors, rotary knob „AMPERAGE“, push-button switch "LOAD" with built-in pilot lamp, push-button switch "MONITORING" with built-in pilot lamp, pilot lamps "CONDUCTOR BREAK" and "CONDUCTOR SHORT CIRCUIT".

Sets of loading weights

for the mechanical load of the cables or cords under test with loads of 0.5 kg to 9.0 kg in steps of 0.5 kg.

Disks of round steel, with centric bore-hole for the sample, basic weight 0.5 kg including clamping harness, in duplicate each. The weights can be assembled easily by means of threads.

▪ Accessories:

Set Of Pulleys

pulley body made of anodized aluminium, exchangeable, for the guidance of the cables or cords under test, 4 pieces each, not included in standard outfit:

Groove base diameter	Groove dimensions	According to for example		Article No.
		IEC	VDE	
60 mm	7 mm x 3 mm	60227-2	0472	F 43.21
60 mm	R = 4 mm	60227-2	0472	F 43.22
80 mm	R = 5 mm	60227-2, 60245-2	0472	F 43.24
120 mm	R = 7 mm	60227-2, 60245-2	0472	F 43.26
160 mm	R = 8 mm	60227-2, 60245-2	0472	F 43.27
200 mm	R = 9 mm	60245-2	0472	F 43.28
180 mm	R = 11 mm	60065		F 43.29

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PRÜFEINRICHTUNGEN TEST EQUIPMENT
PTL Dr. Grabenhorst GmbH
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PTL - Abrasion Resistance Testing Machine

to determine the durability of cable coverings, flexible insulating tubing, coats of lacquer, inscriptions, designations and the like at room temperature by scraping to and fro according to the "REPEATED-SCRAPE-TEST" procedure

according to **DIN 29 867** :1979-11 § 4.3.3, 4.3.4, 5.1.9 and 5.1.10 Fig. 2.

Standard outfit:

1 drive unit, with eccentric drive, speed 60 (-10) rpm, stroke 10 mm + 2 mm,

1 scraping head rod with rotation bearing and with arresting device,

1 scraping head with holding device for the test mandrels, with rod to guide the weight pieces, each 10 test mandrels Ø 0.45 mm and Ø 0.6 mm,

1 sliding plate for the linear movement and height adjustable specimen support with clamping jaws for specimens with diameters up to 12 mm,

1 set of weights, for load of the test mandrel, with weight pieces for loads with a total mass from 150 g up to 1 750 g in steps of 10 g,

1 electronic predetermining pulse counter, 5-digit, to indicate the number of cycles and to disconnect the machine when reaching the preselected number of cycles,

1 control device, electric circuit for disconnection with maximally 50 V DC, disconnecting current approx. 0.05 A, „ON/OFF"-switch, „START"- and „STOP"-button, and switch „FAULT" to indicate that the insulation of the specimen support has been scraped off.

Design:

19"-rack with steel sheet housing, papyrus-white structure varnished, width approx. 510 mm, height approx. 250 mm, depth approx. 370 mm, parts made of stainless steel, anodized aluminium or black-oxide-finished steel, with mains connecting cord set, for connection to 230 V AC 50 Hz.

Article No. F 45.61

▪ Spare parts:

Test Mandrels

steel grade X 12 CrNi 17 7 according to DIN 17 224, made of round spring wire according to DIN 2076, dimensional accuracy C, smooth, polished, without surface refinement,

50 pieces	diameter 0.45 mm	**Article No. F 45.83**
50 pieces	diameter 0.60 mm	**Article No. F 45.87**

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PRÜFEINRICHTUNGEN TEST EQUIPMENT
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PTL - Lampholder Test Machine

to examine the wear of or the harmful effects on Edison screw lamp holders in normal operation, without electric load

according to **IEC 60238** :2011-06 § 18 Fig. 4 - 5.

Standard outfit:

1 worm drive, with pull tape, with rope pulley of diameter 102 mm effectively, with weight carrier, with a device to select E 14-, E 27- and E 40-guide thread, with a shaft stub to fasten the test cap,

1 geared motor, with crank, speed 15 rpm, mounted on the casing,

1 adapter for taking up the specimen, central axis movable and turn able to be in alignment with the axis of the test cap, to be secured sturdily by clamping, on a holding trestle, mounted movable on the base support, with a threaded rod at the top to support the thrust,

1 base support, 650 mm long, with 2 bearing bases, mounted on the casing,

1 control unit with main switch with EMERGENCY STOP function, push buttons "I" and "O" and predetermining counter,

1 monitoring unit with proximity switch to realize the mechanical limit position of the test cap and with an extra-low voltage power supply to verify the contact making of the specimen,

1 casing containing the control unit, protection hood with a safety switch.

Design:

Casing of sheet steel, papyrus-white structure varnished, protection hood made of aluminium profiles, steel parts browned or nickel-plated, floor space of the casing 700 mm x 380 mm, total height approx. 440 mm with protection hood closed, for operation on top of a table with a height of approx. 800 mm because of the up-and-down motion of the weight pieces, for connection to 230 V AC 50 Hz.

Article No.	F 46.07

▪ Accessories:

Test Cap

with suitable weight to apply the prescribed screw-in torque.

Thread	Weight	
E 14	0.8 / 2 kg	F 46.36
E 27	3 kg	F 46.27
E 40	6 kg	F 46.38

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PRÜFEINRICHTUNGEN TEST EQUIPMENT
PTL Dr. Grabenhorst GmbH
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PTL - Cord Anchorage Test Machine

for testing cable connections with intermittent tensile load

according to **IEC 60884-1** :2013-02 § 23.2 Fig. 20,
IEC 60065, **IEC 60238**, **IEC 60320-1**, **IEC 60335-1**, **IEC 60598-1**, **IEC 60950**…

Standard outfit:

1 base frame with inset wooden plate, housing of steel sheet,
1 eccentric disc, diameter 125 mm, eccentricity 32.5 mm,
1 AC geared motor with additional gear reduction to approx. 50 rpm,
1 lever for the specimen, with track wheel,
1 weight holder with precise height adjustment and clamping mechanism with various gripping dies to match the cord size and shape,
1 set of weights for loads from 10 N to 200 N in steps of 10 N,
1 switch unit with contactor, thermal excess-current release, fuses and electrical predetermining counter, six-digit, resettable, to indicate the number of strokes.

Design:

Steel weldment, papyrus-white structure varnished, lever made of anodized aluminium, some parts black-oxide-finished or of stainless steel, in the front a door with pane of polycarbonate and with door switch, in the rear a fixed pane of polycarbonate, base area approx. 240 mm x 540 mm, total height approx. 900 mm, for connection to 230 V AC 50 Hz.

Article No. **F 47.35**

Further weights for e. g. tests
in accordance with IEC 60309-1 and VDE 0623-1: ***on request***

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PRÜFEINRICHTUNGEN TEST EQUIPMENT
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PTL - Inclined Plane Devide

to determine the stability of electric appliances which are used on a table or on the floor

according to

IEC 60065-1 :2011-02 § 19.1; **IEC 60335-1** :2010-05 § 20.1; **IEC 60950** :2013-05 § 4.1.

Standard outfit:

1 table board, with stiffening frame,

1 base frame with hinges for the stiffening frame and for the spindle bearing,

1 threaded spindle with handwheel for adjusting the incline of the table board from the horizontal up to 30° against the horizontal,

1 lifting nut, of red brass, articulated in the jib of the stiffening frame,

2 knurled nuts at the threaded spindle, for adjusting the maximum incline,

1 flat steel bar, approx. 3 mm high, approx. 20 mm wide, screwed on the table board, detachable, to prevent the sample from sliding.

Design:

Table board of block board, plastic laminated on both sides, approx. 25 mm thick, stiffening frame and base frame welded of rectangular tubes, papyrus-white structure varnished.

	Table area:	Max. load:	Article No.
Inclined Plane Device 13	500 mm x 500 mm	50 kg	F 51.13
Inclined Plane Device 15	700 mm x 700 mm	75 kg	F 51.15
Inclined Plane Device 17	1 000 mm x 1 000 mm	100 kg	F 51.17

▪ Special outfit:

Inclination Angle Measuring Instrument

to mount at the table board, consisting of a protractor with adjustable spirit level for checking the angle of inclination of the table board.

Article No. F 51.63

Railing

to catch the samples with insufficient stability, mounted on to the stiffening frame of the table board.

Article No. F 51.7x

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PRÜFEINRICHTUNGEN TEST EQUIPMENT
PTL Dr. Grabenhorst GmbH
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PTL - Impact Strenght Stell Ball

for testing the mechanical strength and the impact strength by pendulum test resp. by drop test

according to **IEC 60598-1** :2008-04 § 4.13.4a Fig. 2; **IEC 60950** :2013-05 § 4.2.5 Fig. 4A…

Standard outfit:

1 steel ball, diameter 50 mm ± 0.3 mm, mass 500 g ± 25 g, with 2 thread bores M 4,
2 eye screws M 4 of steel, detachable, for pendulum tests.

Design:

Steel ball hardened, ground and polished.

Article No. F 53.32

PTL - Coax Test Plug

for mechanical tests on antenna coaxial sockets

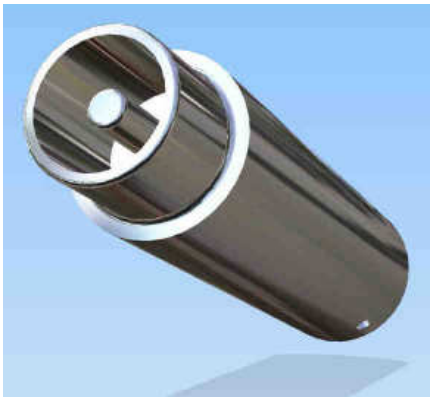
according to **IEC 60065** :2011-02 § 12.5 Fig. 9.

Standard outfit:

1 Test plug.

Design:

Made of hardened steel, ground and polished.



Article No. F 53.60

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PRÜFEINRICHTUNGEN TEST EQUIPMENT
PTL Dr. Grabenhorst GmbH
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PTL - Switch Actuating Unit

as actuating unit for tests of breaking capacity and behaviour in normal use, to switch on and off switches for household and similar purposes having rated resistive-load currents up to 16 A, at room temperature, pneumatically driven

according to **IEC 60669-1** :2007-01 § 18-19.

Standard outfit:

1 or 3 actuating device(s) for rocker switches and push-button switches with 2 single-acting pneumatic cylinders each, stroke 15 mm, with air throttle valves to adjust the actuating speed, height-adjustable mounted to holders, with multiple adjustable specimen holders, with sockets to connect the specimens to external test voltages and loads,

1 housing with protective hood, with plug-in unit with front panel for the operating devices,

1 control device for the entire unit: main switch with EMERGENCY STOP function, safety switch for the protective hood,

1 control device for each actuating device: Programmable control unit with different programmes for the "test rhythm", and for adjusting and indicating the test parameters "cycle time" and "counter", start and stop push-buttons, push-buttons for moving manually the cylinder pistons and as actuation indicator for the cylinder.

Design:

Desk-top unit, plug-in unit construction housing, black-gray structure varnished, front panel of anodized aluminium, small parts black-oxide-finished, for connection to PTL Power Supplies of N 03 series – by multiple coupler – or to other test voltage sources and test loads – by menas of an adapter,

for 1 switch, **Article No. F 55.11**

for 3 switches. **Article No. F 55.13**

▪ Accessories:

The following devices for testing other types of switches can be exchanged against the devices for rocker switches and push-button switches:

Tumbler Switch Test Device

for one tumbler switch or cord-operated switch

Article No. F 55.82

Rotary Switch Test Device

for one rotary switch

Article No. F 55.87

Power supplies with resistive and inductive loads: ***see prospectuses N 03***

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PRÜFEINRICHTUNGEN TEST EQUIPMENT
PTL Dr. Grabenhorst GmbH
DE-95343 Stadtsteinach P.O. BOX 12 53

PTL - Coupler Actuating Unit

as actuating unit for tests of breaking capacity and behaviour in normal use, insert and withdraw plugs and socket-outlets, cable couplers and appliance couplers for household and similar purposes having rated resistive-load currents up to 16 A, at room temperature, pneumatically driven

according to **IEC 60884-1** :2013-02 § 20-21, Fig. 16.

Standard outfit:

1 or 3 slide(s), with ball bearing guide, with spring loaded support for fastening the moving part for the specimens, with double acting pneumatic cylinder, with air throttle valves to adjust the actuating speed, with sockets to connect the specimens to external test voltages,

1 or 3 holder(s), multiple adjustable, for fastening the fixed part for the specimens, with sockets to connect the specimens to external test loads,

1 housing with protective hood, with plug-in unit with front panel for the operating devices,

1 control device for entire unit: Main switch with EMERGENCY STOP function, safety switch for the protective hood,

1 control device for each slide: Programmable control unit with programme for the "test rhythm" and for adjusting and indicating the test parameters "counter" and "cycle time", start and stop push-buttons, push-buttons for moving manually the cylinder pistons and as actuation indicator for the cylinder.

Design:

Desk-top unit, plug-in unit construction housing, black-gray structure varnished, front panel of anodized aluminium, small parts black-oxide-finished, for connection to PTL Power Supplies of N 03 series – by multiple coupler – or to other test voltage sources and test loads – by means of an adapter,

for 1 socket-outlet or plug,	**Article No.**	**F 55.31**
for 3 socket-outlet or plug.	**Article No.**	**F 55.33**

▪ Accessories:

Test Plugs with hardened and ground pins made of steel:

according to **CEE 7** :1963-05	Standard sheet IV	F 55.71
according to **IEC 60320-1** :2007-11	Standard sheet C2	F 55.77
according to **IEC 60320-1** :2007-11	Standard sheet C8	F 55.78
according to **IEC 60320-1** :2007-11	Standard sheet C14	F 55.79

Further Test Plugs, e.g. according to NEMA and BS: ***on request***

Power Supplies with resistive and inductive loads: ***see prospectuses N 03***

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PRÜFEINRICHTUNGEN TEST EQUIPMENT
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PTL - Clamping Device Test Machine 10

to test the reliability of clamping devices to hold flexible electrical conductors

according to **IEC 60669-1** :2007-01 § 12.2.5, 12.3.10; Tab. 4; Fig. 10,
IEC 60884-1 :2013-02 § 12.2.5, 12.3.10; Tab. 9; Fig. 11,
IEC 60998-2 relevant sections,

however for cross-sectional areas up to 10 mm^2 only.

Standard outfit:

1 revolving platen with vertical axis of rotation, to move the conductor, clamped into the specimen,

1 accommodation for bushings, with angular contact ball bearing, built into the revolving platen with eccentricity 37.5 mm, bore 15 mm,

1 DC motor to drive the revolving platen at 10 rpm ± 2 rpm,

1 hand vice to fix the specimen, height (H) adjustable to 260 mm and 280 mm, with interchangeable jaws,

3 collar bushings to guide the conductor clamped into the specimen, with bore hole diameter 6.4 mm, 6.5 mm and 9.5 mm *), to be inserted into the accommodation of the revolving platen,

1 weight piece carrier, mass 0.3 kg *), with clamping device, to be suspended from the testing conductor,

1 set of weight pieces for a total mass up to 2.0 kg *),

1 circuit continuity tester to monitor the clamping point, to stop the timer and to switch off the whole machine,

1 rack mounted unit with control panel, main switch with EMERGENCY STOP function, timer to preselect the desired test duration, push-button for inching, start and stop push-buttons as well as switch to activate monitoring by the circuit continuity tester.

Design:

Article No. F 58.16

Desktop housing made of steel, papyrus-white structure varnished, revolving platen and weight pieces made of black-oxide-finished steel, collar bushings made of brass, dimensions: width approx. 500 mm, depth 500 mm, height 800 mm, for connection to 230 V AC 50 Hz.

▪ Alternatively:

Clamping Device Test Machine 16

as above, however reinforced version for conductor cross-sect. areas up to 16 mm^2, with appropriate collar bushings and loading weights.

Article No. F 58.10

*) *Other bore hole diameters and weight pieces:* ***on request***

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PRÜFEINRICHTUNGEN TEST EQUIPMENT
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PTL - Surge Test Apparatus

to test the surge strength of insulations, resistors and capacitors / RC-units in mains operated electronic and related apparatuses for household and similar general use

according to **IEC 60065** :2011-02 § 10.1 und § 14.1a Fig. 5a and Fig. 5b,
IEC 60950-1 :2013-05 § 1.7.7.3 and § 7.4.2 Fig. N.2.

Standard outfit:

1 High voltage supply 10 kV DC 1.5 mA,
1 voltage indicat. instrument with digital display,
1 high voltage capacitor 1 nF,
1 switch „S“ according to Fig. 7a,
1 interval pulser to control the switch "S",
1 electronic switch with hermetically encased High Voltage Reed Relays, key switch to select the switching mode „Mechanically“ or „Electronically“,
2 sockets in the testing cabinet to connect the specimen „X“,
1 BNC terminal connected in series with a voltage divider, to connect an oscilloscope,
1 Socket outlet with test lead for connecting big specimens,
1 Electrode Arrangement to test the surge strength according to IEC 60065 Fig. 6, built in test cabinet, with upper metal pin having a mass of 100 g, lower metal pin and frame holder.

Electrode arrangement

Design:

Housing papyrus-white structure varnished, width 505 mm, depth 480 mm, height 720 mm, control unit in 19" rack, testing cabinet with polycarbonate panes and safety switches, all parts in the testing cabinet made of insulating materials, for connection to 230 V AC, 50 Hz.

Article No. **H 06.10**

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PRÜFEINRICHTUNGEN TEST EQUIPMENT
PTL Dr. Grabenhorst GmbH
DE-95343 Stadtsteinach P.O. BOX 12 53

PTL - Creepage Distance Gauges

for gauging the creepage and clearance distances - in dead state - between parts under voltage in the operating conditions as well as between touchable metal pieces and parts under voltage in the operating conditions, e. g. in installation material, switchgears, plugs, socket-outlets and electric appliances

according to **IEC**- and **CEE**-Publications, **EN**-standards, and **VDE**-specifications.

Standard outfit:

1 gauge block, cross section approx. 1 mm x 1 mm, distances between measuring faces by agreement from 1 mm to 8 mm with a tolerance of - 0.02 mm,
with shaft, cross section approx. 2 mm x 1 mm,
and with grip, approx. 12 mm x 40 mm x 1 mm,
rounded, with bore and engraving
(distance / mm, e. g. "5.0").

Design:

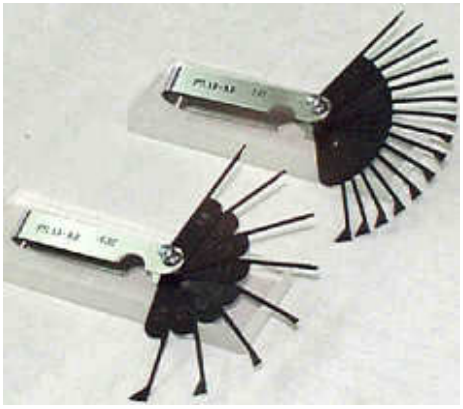
made of spring steel, hardened and black-oxide-finished, measuring faces ground plane parallel, total length approx. 70 mm.

Article No. L 25.xy

with XY = distance between measuring faces in 1/10 mm. Example: The Article No. of the creepage distance gauge with distance between measuring faces of 3,5 mm is: L 25.35.

▪ Assortments:

Bunches of a set of gauges assorted in a casing of stainless steel.



Creepage Distance Gauges Bunch A

with 8 creepage distance gauges
1,0 - 1,5 - 2,0 - 2,5 - 3,0 - 4,0 - 6,0 - 8,0 mm

Article No. L 25.81

Creepage Distance Gauges Bunch B

with 15 creepage distance gauges 1,0 bis 8,0 mm
in der Stufung 0,5 mm

Article No. L 25.84

In some publications, standards and specifications, there are distances to be gauged, which are beyond the distance range chosen for Creepage Distance Gauges. To gauge distances below 1 mm, we recommend to use feeler gauges.

Creepage distance gauges for other distances: ***on request***

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PRÜFEINRICHTUNGEN TEST EQUIPMENT
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PTL - Tracking Test Apparatus

on insulating materials and components made of insulating material

according to **IEC 60112** :2009-10,
necessary for tests according to e.g. **IEC 60065**, **60238**, **60309-1**, **60320-1**, **60335-1**, **60598-1**, **60669-1**, **60670-1**, **60730-1**, **60745-1**, **60884-1**, **60947-1**, **60950-1**, **61058-1**.

Tracking resistance

It must be accepted that, in normal use, components made of insulating material may become moist and dirty. If the impurities are electrically conducting, current will flow between parts of different voltage potentials - the tracking current. As a result, small flashovers may occur, which cause thermal stresses to the surface of the insulating material.

The visual result of thermal decomposition of the insulating material caused by the tracking current is called the track. The interconnecting formation of carbonized material forms a tracking path, by which a lasting current conducting connection results. Thereafter the component cannot fulfill its intended electrical function in the majority of cases and parts may catch fire. The resistance of an insulating material to track formation is called the tracking resistance.

Test method

The behaviour of the surface of solid insulating materials under the influence of tracking currents is to be determined as follows: The tracking currents are produced by allowing drops of an electrically conductive solution to fall centrally between two electrodes which are put on the sample and subjected to an alternating voltage:

- *What highest voltage causes no breakdown up to 50 drops, while another voltage, 25 volts lower than the previously used voltage, causes no breakdown up to 100 drops? (Method CTI).*
- *Does no breakdown occur at a given voltage up to 50 drops each? (Method PTI).*

Testing apparatus

Platinum is specified as a material for the electrodes. The power supply unit is designed for voltages up to 600 V, resp. up to 1 000 V. An electronic control unit serves for releasing the drops.

In the case of the PTL tracking test apparatus, the electrode arrangement is mounted in a cabinet with polycarbonate panes. By two wing doors, a good accessibility of the testing arrangement ensures a pleasant working. A safety system breaks the supply when the cabinet is opened.

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PTL - Tracking Test Apparatus (continuation)

Standard outfit:

1 Pair of electrode holders, swivelling and adjustable in height, pressure force with inserted electrodes each 1 N, distance between electrodes adjustable,

1 Pair of Platinum Electrodes, with dimensions in accordance with IEC 60112, 30° chisel-edged at both ends, made of platinum, purity 99.9 %,

1 drop dispensing unit, adjustable in height, easy to dismantle, container cylinder of acrylic glass, jet nipple Ø 1.0 mm, adjustable valve needle with electromagnet,

1 timer for the electromagnetic valve for an impulse every 30 seconds, impulse width adjustable for setting the drop size, with resettable counter for switching off the apparatus, with digital display for the testing time in minutes and seconds,

1 isolating transformer and variable ratio transformer for setting the testing voltage, output 1 kVA, voltage drop less than 10 %,

1 sample desk, precisely adjustable in height by a thumb wheel, with plate of glass,

1 adjustable resistor to limit the current to 1 A,

1 current indicating instrument 1.5 A, true r.m.s., class 1.5,

1 voltage indicating instrument, true r.m.s., class 1.5,

1 excess-current relay 0.5 A, response time 2 s independent of current,

4 keys for operation mode SINGLE DROP, TESTING, OFF and ADJUSTING.

Design:

Housing papyrus white structure varnished, width 505 mm, depth 480 mm, height 740 mm, control unit in 19" rack system, testing cabinet with panes easy to replace, with safety switches, with green lamp "ready for operation" and red lamp "danger", all parts in the testing cabinet made of no corroding or corrosion protected materials, delivery including mains connection cord set, 2 safety keys, testing solution A, bag with NH4Cl, bag with Nekal BX dry, measuring cylinder 2 ml and gauge to adjust the distance between the electrodes to 4 mm and the dropping height to 35 mm, for connection to 230 V AC, 50...60 Hz.

Max. test voltage:	Ranges of the volt. indicator:	Art. No.
600 V	300 / 600 V	M 31.06
1 000 V	300 / 600 / 800 / 1 000 V	M 31.10

▪ Spare parts:

Platinum Electrodes 1 pair, with dimensions in accordance with IEC 60112, 30° chisel-edged at both ends, made of platinum, purity 99.9 %. M 31.81

Plate of glass f. sample desk:	M 31.91	**Cap nut of PTFE:**	M 31.96
Jet nipple of PTFE:	M 31.92	**Cap nut of stainless steel:**	M 31.97
Jet nipple of stainless steel:	M 31.93	**Valve seat of PTFE:**	M 31.98
		Cylinder of acril glass, Ø 50 x 50:	M 31.99

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PRÜFEINRICHTUNGEN TEST EQUIPMENT
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PTL - Power Supply

with resistive loads and inductive loads as Test Power Supply for testing the breaking capacity and the behaviour during normal use of switches resp. of plugs or socket-outlets for household and similar purpose with resistive-load rated currents up to 16 A for tests with alternating voltages

according to **IEC 60669-1** :2007-01 § 18 and § 19.1,
IEC 60884-1 :2013-02 § 20 and § 21,

however not for tests with direct current and with direct voltage.

Fundamental design

A power supply consists of the power unit which provides the adjustable test voltage, as well as the resistive load units and the inductive load units.

Operation as agreed

The power supply is primarily designed for

- testing the breaking capacity and
- testing the behaviour during normal use

for operation together with PTL Actuating Units of the series F 55. For this, both components are connected by means of a connecting lead with multiple connector. By this a reciprocal cut off of the components is ensured, in normal test duty as well as in case of fault, caused by the specimen or by one of the components.

It is possible to operate the specimen manually or to connect an other than a PTL Actuating Unit, but then, a cut off of the test voltage at the specimen is not ensured, and thus safety of staff is endangered.

Further employment

Further possible applications may be considered. For example checking electric lines and fuses is possible. Or an other than a PTL Actuating Unit can be connected.

The resistive and the inductive load units are floating. Therefore, they can be employed arbitrarily and also independently of the main transformer.

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PTL - Power Supply (continuation)

Design:

Trestle of rigid steel tubes with feet, suitable for transportation by forklift, slide bars for the slide-in modules, bottom, side walls and rear wall covered by steel sheets, lower part of the rear with intake opening(s), top with exhaust opening(s), both prepared for mounting air ducts, slide-in modules of rigid steel bars, front panels of anodized aluminium, steel parts structure varnished black-gray.

For connection to three-phase 3 x 400 V / PE 50 Hz, mains connection cable with plug and inclusive fitting socket-outlet for wall fastening.

Article No. N 03.23

▪ Available models:

Power Supply 23

1 x 20A, 275V AC, cosφ 1 - 0.3 ind.
One phase model, suitable for testing one single phase specimen (Fig. see page 1)

Power Supply 43

3 x 20A, 275V AC, cos φ 1 – 0.3 ind.
Three phase model, suitable for testing up to three single phase specimens or for testing one three-phase specimen (Fig. on this page)

Article No. N 03.43

Dimensions and weights:

Model	**approx. dimensions** (width x depth x height)	**net weight**
N 03.23	620 x 850 x 1 920 mm	350 kg
N 03.43	1 760 x 850 x 1 920 mm	995 kg

▪ Description:

Slide-in modules

The individual components are accommodated in slide-in modules:

- in the bottom slide-in module the AC power unit,
- in the middle slide-in module the inductive load unit,
- in the top slide-in module the resistive load resistor unit.

The slide-in modules can be pulled out like a drawer. To prevent that the leads are stretched or that the slide-in modules will tip over, there are stops that can be fold back..

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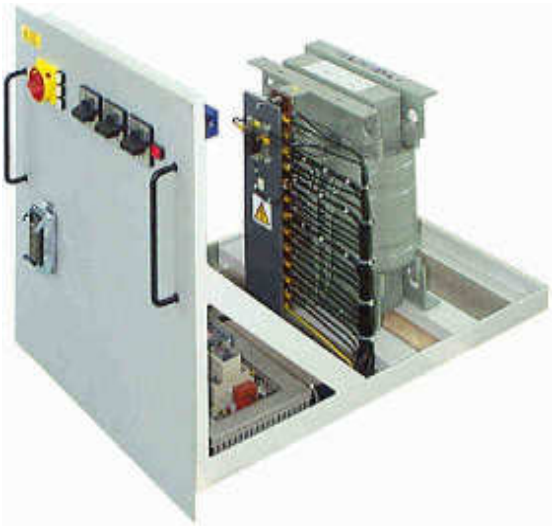
PTL - Power Supply (continuation)

AC power unit



The AC power unit in the bottom slide-in module consists essentially of the main transformer.

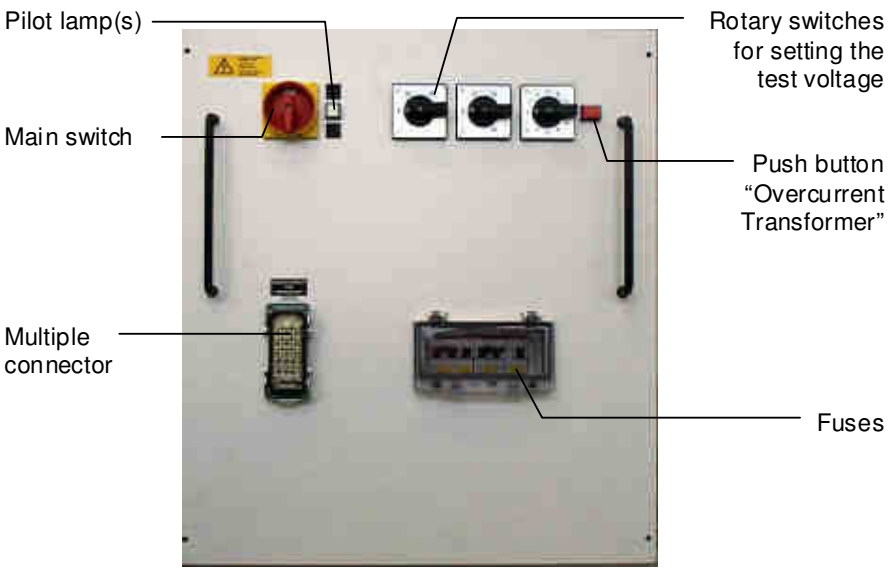
The main transformer is primarily operated with the mains voltage. The secondary voltage is switchable by three rotary switches in coarse, medium and fine steps.

The main switch (1-fold at N 03.43) with pilot lamp(s) indicating the presence of mains voltage and an industrial multiple connector (1-fold at N 03.43) are in the bottom slide-in module, too. The connector is prepared for connection of switch- or coupler actuating units. Four fuses serve as automatic cut-out for the control transformer, the control unit, the main transformer and the test circuit.

Data of the AC power unit

Design of the main transformer	single phase dry transformer
wiring of the windings	4 separate windings
primary voltage and frequency	400 V 50 Hz without N
secondary voltage and power	0 up to 300 V, approx. 7,5 kVA
setting of the secondary voltage	3 rotary switches coarse, medium, fine
permissible secondary current	25 A at 50% duty ratio *(cyclic duration factor)*
continuous operation	only allowed during sufficient ventilation
electronic overload release	at approx. 28 A

Front panel view:



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PTL - Power Supply (continuation)

Resistive load unit

The resistive load unit serves for setting the test current. It consisting of heating grids, built into a duct in the top slide-in module. They can be switched by three rotary switches in coarse, medium and fine steps in any desired combination. The sum of the setting values on the rotary switches is equal to the current flowing through the specimen at 250 V and cos φ = 1. The resistive load unit is floating.

An axial flow fan serves for cooling the grids. It is monitored by a difference pressure switch.

Data of the resistive load unit

Design of the resistive load unit ..... heating grids in a square shaped duct
wiring of the heating grids ..... parallel connection
setting of the test current ..... 3 rotary switches coarse, medium, fine
setting range of resistive load unit..... 0.1 to 25 A in steps of 0.1 A
permissible test current..... 25 A at 50% duty ratio *(cyclic duration factor)*
continuous operation ..... only allowed during sufficient ventilation
electronic overvoltage release ..... at approx. 285 V

Multifunctional power meter

The measuring instrument A2000 acquires voltages, current, frequency and phase displacement. It calculates active, reactive and apparent power, active and reactive energy, as well as the power factor for the individual phases based upon these values.

Factors settings for the indications:

Test Voltage in V
Test Current in A
Power Factor cos φ (inductive)
Phase
Frequency in Hz

With the setting buttons these indications can be changed:
Selection of phase, of measured quantities, display of maximum and averaged values.

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PTL - Power Supply (continuation)

Inductive load unit

The inductive load unit is constituted by a fine step air-core inductor. It is switched over by means of three rotary switches in coarse, medium and fine steps. The three rotary switches may be set in any desired combination. The sum of the settings is corresponding to the inductivity.

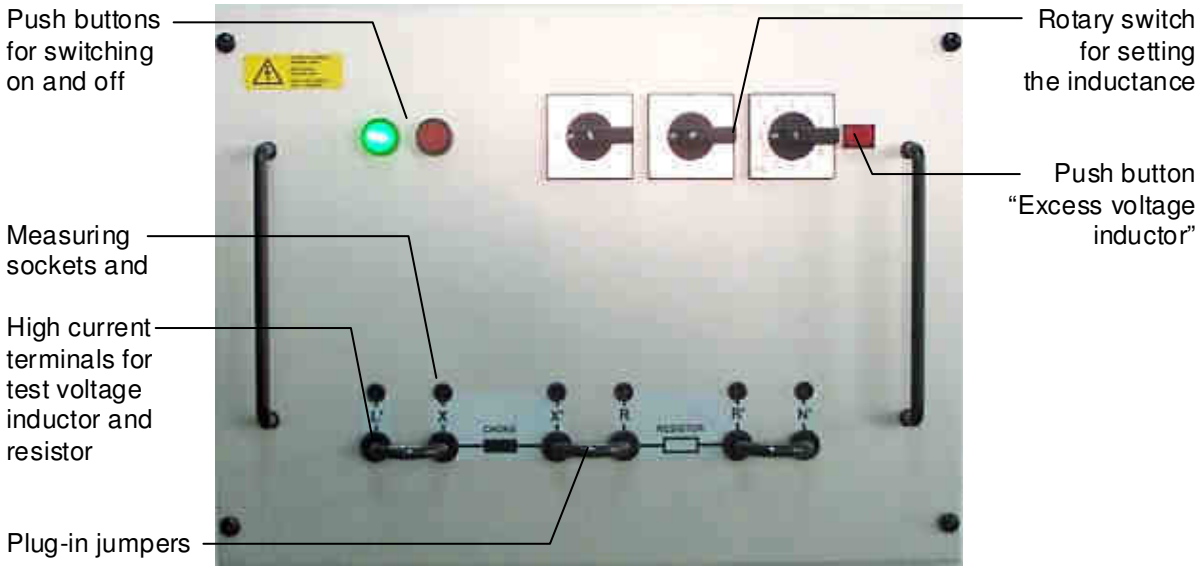
In accordance with the test specifications the inductor has shunt resistors with a relatively high resistance, so that only about 1 % of the current flows through the shunt resistors.

The inductive load units are floating.

Data of the inductive load unit

Design of the fine step air-core inductor..... 3 separate windings of copper wire
wiring of these 3 windings..... connected in series
internal switching over of each winding..... by step switches
setting of the inductance..... 3 rotary switches coarse, medium, fine
permissible current ..... 25 A at 50% duty ratio *(cyclic duration factor)*
continuous operation ..... only allowed during sufficient ventilation
auxiliary resistors, shunted ..... for approx. 1 % of the inductor current
electronic overvoltage release ..... at approx. 275 V

Front panel view:



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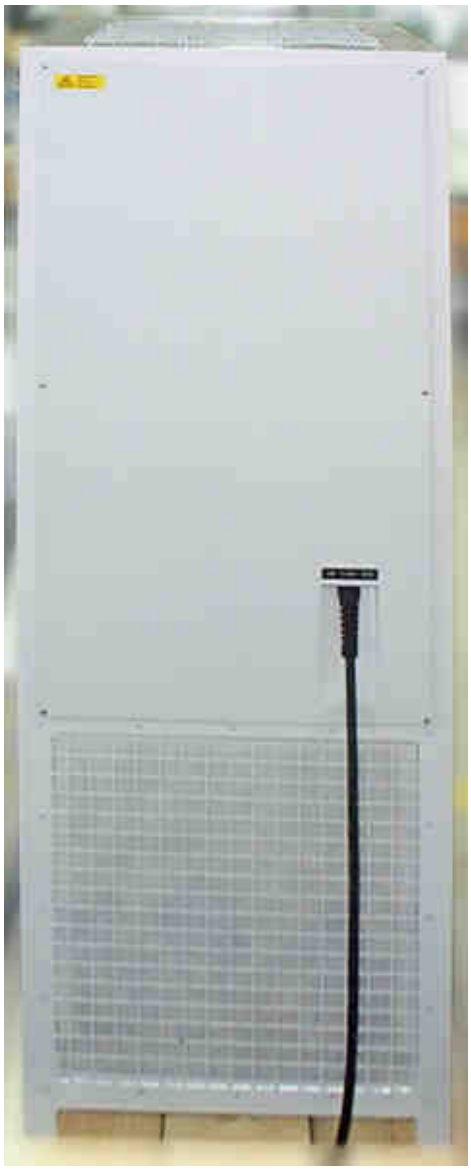
PTL - Power Supply (continuation)

Cooling

A fan is mounted at the lower end of the duct accommodating the heating grids. It presses the cooling air through the heating grids. It draws off the air from the internal and external surfaces of the inductor and the air heated by the main transformer as well.

The cooling air is drawn across the intake openings from the laboratory room. An air filter serves to prevent pollution of the components built in. The exhaust air is blown out upwards across a square exhaust opening.

If the air should be drawn in from outside and / or if the warm exhaust air gets annoying in the laboratory, intake and exhaust ducts are to be mounted. The ducts should have sufficient cross section in order to keep the air resistance low. The existing tapped holes can be used for flange-mounting.



Monitoring elements

A difference pressure switch monitors the pressure drop in the duct accommodating the heating grids. If the fan fails or if the flow of air is throttled inadmissibly, the unit is switched off by the master contactor.

Additional monitoring elements serve to guard against damage by overload for

- the Resistive load unit,
- the Inductive load unit,
- the AC power unit.

In case of excess voltage or over-current an electronic excess voltage resp. over-current release responds, the unit is switched off by the master contactor.

Power supplies for higher test currents: ***on request***

Fluorescent lamp equivalent accessories: ***on request***

Actuating units for e.g. switches and socket outlets: ***see F 55.10 and F 55.30***

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PRÜFEINRICHTUNGEN TEST EQUIPMENT
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PTL - Drip Box

*for checking the protection against ingress of water to prove the degrees of protection **IPX1** "Protection against water drops" and **IPX2** "Protection of a specimen in a position of tilt against water drops"*

according to **IEC 60529** :2001-02 § 14.1 Tab. VIII, Fig. 3.

Standard outfit:

1 water tank with drip nozzles in the bottom spaced 20 mm x 20 mm, provided with a hermetically tight cover, with overpressure / air drain valve, with 3 chains and holding devices each for suspending, precisely adjustable for levelling,

1 flow control valve with flow indication, with ball valve and rapid coupling to feed or to drain the water, on a separate plate for mounting on the wall,

1 set of hoses to feed and to drain the water and the overpressure, each 5 m long,

1 grate as carrier for the specimens, with 3 holding devices to suspend from the chains, precisely adjustable for levelling.

Design:

Water tank of anodized aluminium, without throttling means like the formerly usual cloth filters,

A) for suspending from the ceiling with 3 eyebolts and metal dowels
or B) for suspending from a frame for mounting on the wall, see Fig.,

from 200 mm to 2 000 mm infinitely adjustable with a maximum height of the specimen of 800 mm, designed for a height of the ceiling up to 4 m, for other ceiling heights on request, grate, chains, frame and drip nozzles of stainless steel.

Drip area [mm x mm]	**Quantity of drip nozzles**	**Method of mounting**	**Space requirement** w x d x h [mm]	**Article No.**
400 x 300	300	A) at the ceiling	450 x 450 x 3 100	**P 01.12**
800 x 400	800	A) at the ceiling	850 x 550 x 3 100	**P 01.15**
1 000 x 500	1 250	A) at the ceiling	1 050 x 650 x 3 100	**P 01.18**
400 x 300	300	B) on the wall	520 x 550 x 3 100	**P 01.32**
800 x 400	800	B) on the wall	920 x 650 x 3 100	**P 01.35**
1 000 x 500	1 250	B) on the wall	1 120 x 750 x 3 100	**P 01.38**

Other types, e. g. with other drip areas or on a stand with stable frame work: ***on reques***

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PRÜFEINRICHTUNGEN TEST EQUIPMENT
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PTL - Oscillating Tube Units

*for checking the protection against water to prove the degrees of protection **IPX3** "Protection against spraying water" and **IPX4** "Protection against splashing water"*

according to **IEC 60529** :2001-02 § 14.1 Tab. VIII, Fig. 4.

Standard outfit:

A **Oscillating appliance**, housing with base frame, trestle, lid, and cover sheets, with 1 or 2 Drive Unit(s) inside, with brake release switch, EMERGENCY STOP switch, water tight socket to connect a turntable and with Water System:

1 / 2 **Drive unit(s)**, by geared motor(s), with driven shaft to screw on the oscillating tubes, oscillating speed 60 °/s, with swivelling angle sensor, swivelling angle limiting safety switch and electromagnetic brake,

1 **Water system** with fine filter to be cleaned by reverse flow, pressure regulator and pressure indicating instruments, adjustable flow regulating valve and flow indicating instrument, electromagnetic valve and rotary union to supply the water through the driven shaft, prepared to connect a hose of nominal diameter 1/2".

1

2

B **Endsupport frame** for floor fastening, with 1 or 2 bearing unit(s) with flange to screw on the oscillating tubes *(separately to order, see page 2!)*,

C **Control box**, wall fastening type, with rotary knob “oscillation angle“, main switch with EMERGENCY STOP function, push button “O“ to stop and push button “ I “ to start the operations, frequency converter and electronic controls for reversal of the oscillation movement, switches for water, oscillating drive and turntable drive, fuses and thermal excess current release.

3

Design:

base frame of the oscillating appliance and of the endsupport made as weldment of stainless steel, trestle, lid and cover sheets of stainless steel sheet, all parts primed and structure varnished papyrus-white with stone-grey accents, for fastening at the floor with 4 levelling elements and 4 fixing screws each, flanged shafts of stainless steel, degree of protection of the electrical installation IP65.

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PTL - Oscillating Tube Units (continuation)

PTL Oscillating Tube Units are designed for fixed installation in water test rooms. These rooms should show appropriately waterproof floors and walls and should have a water connection as well as a drain.

The dimensions of the specimen and the available room dimensions are main criteria for the choice of a suitable plant.

Possible oscillating tube radii	Quantity of flanged shafts	Axis height above floor	End-support	Article No.
R 200 mm up to R 600 mm	1 (*Fig. 4*)	1 300 mm	without	P 02.12
R 200 mm up to R 1 000 mm	1 (*Fig. 1*)	1 300 mm	frame	P 02.17
R 200 mm up to R 1 600 mm	1	1 900 mm	frame	P 02.19
R 200 mm up to R 600 mm	2	300 mm [a)] und 1 300 mm	without	P 02.22
R 200 mm up to R 1 000 mm	2	300 mm [a)] und 1 300 mm	frame	P 02.27
R 200 mm up to R 1 600 mm	2	300 mm [a)] und 1 900 mm	frame	P 02.29

[a)] *Axis height of the 2nd flanged shaft 300 mm above the floor, on request up to 700 mm*

4

Figures on pages P02/1 and P02/2:

Fig. 1 **P 02.17** with oscillating tube **P 02.54**.

Fig. 2 **Oscillating appliance** with 1 driven shaft, axis height 1 300 mm.

Fig. 3 **Control box**.

Fig. 4 **P 02.12** with oscillating tube **P 02.69** and turn-table **P 17.37** with telescope support **P 17.47**.

Fig. 5 **Endsupport frame** with 2 bearing units, axis heights 1 300 mm and 300 mm.

5

Turntable and Telescope Support *see prospectus P 17*

Spray Test Chamber *for checking the protection against water with Oscillating Tubes, also for installation in laboratories* *see prospectus P 18*

Space requirement shown on the Layout Plan: *on request*

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PTL - Oscillating Tubes B1 and B2 (accessories) (cont.)

Design:

Tubes, flanges and deflectors of stainless steel, spray nozzles of nickel-plated brass with adjustable small tubes of inside diameter 0.4 mm (B1) or 0.8 mm (B2 a)), each with 2 plug fittings for rinsing, centre of semicircle of the oscillating tubes belonging to a set always at the same position, delivery including 2 removable 30°-deflectors.

Oscillating Tubes with 2 flanges for units with opp. bearing (s. Fig.1)

Rated radius	Smallest lenght over flanges	Quantity of spray nozzles	Article No. B1 Ø 0.4 mm	Article No. B2 Ø 0.8 mm a)
R 200 mm	950 mm	12 (+1)	P 02.50	P 02.70
R 400 mm	950 mm	25 (+1)	P 02.51	P 02.71
R 600 mm	1 350 mm	37 (+1)	P 02.52	P 02.72
R 800 mm	1 750 mm	50 (+1)	P 02.53	-
R 1 000 mm	2 150 mm	62 (+1)	P 02.54	
R 1 200 mm	2 550 mm	75 (+1)	P 02.55	
R 1 400 mm	2 950 mm	87 (+1)	P 02.56	
R 1 600 mm	3 350 mm	100 (+1)	P 02.57	

Oscillating Tubes with 1 flange for units without opp. bearing (s. Fig.4)

Rated radius	Smallest lenght over flanges	Quantity of spray nozzles	Article No. B1 Ø 0.4 mm	Article No. B2 Ø 0.8 mm a)
R 200 mm	950 mm	12 (+1)	P 02.67	P 02.77
R 400 mm	950 mm	25 (+1)	P 02.68	P 02.78
R 600 mm	1 350 mm	37 (+1)	P 02.69	P 02.79

a) For operating the oscillating tubes B2 "Outfit bundle Q" is necessary.

▪ Special outfit:

Outfit Bundle Q

for operating Oscillating Tubes B2 (spray nozzles Ø 0.8 mm), to prove the degree of "Protection against Splashing Water with increased pressure" **IPX4K** according to ISO 20653 :2013-02 § 6 Tab. 4 Fig. 4. The Oscillating Appliance has to be provided for significantly increased water flow by using enlarged cross section of water fittings, valves and instruments. ***on request***

Timer

1 to 60 minutes, to stop the water flow and the drives after a preset time. ***on request***

▪ Spare parts:

Nozzles Ø 0.4 mm, 10 pieces, for oscillating tubes B1, Article No. P 02.96
Nozzles Ø 0.8 mm, 10 pieces, for oscillating tubes B2. Article No. P 02.97

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PTL - Water Jet Hose Nozzle

*for checking the protection against water to prove the degrees of protection **IPX5** "Protected against water jets" or **IPX6** "Protected against powerful water jets"*

according to **IEC 60529** :2001-02 § 14.1 Tab. VIII, Fig. 6.

Standard outfit:

1 nozzle element with knurling, with O-ring for sealing,
1 body with flow meter almost independent from position, details see below,
1 handle, internal diameter approx. 16 mm, with thermally insulating cover,
1 flow control and stop valve with hand wheel to adjust the water flow, with hose connection,
1 hose, nominal width 19 mm (3/4"), 5 m long, with 2 hose clamps.

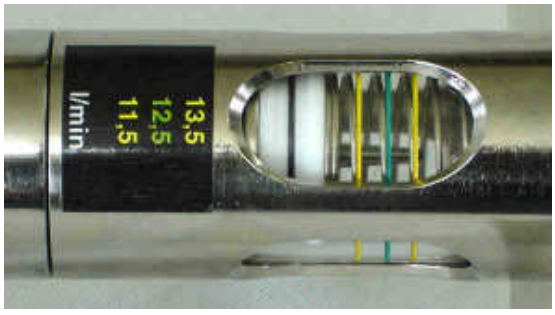
Design:

Nozzle element, body and tube within the handle of stainless steel, valve nickel-plated,

Nozzle diameter:	Degree of protection:	Measuring range of flow meter:	Article No.
6.3 mm	IPX5	11.5 – 12.5 – 13.5 l/min	P 03.26
12.5 mm	IPX6	90 - 100 - 110 l/min	P 03.28

Flow meter:

The flow meter is a „gap meter“, working according to the principle of a variable area flow meter: A float with defined aperture is moving along a tapered pin. The higher the flow rate, the farther the float is moved. The counterforce is caused by a spring. For that the indication is almost independent from the position of the hose nozzle.



A black ring at the spring loaded float serves as a pointer. The green mark on the glass tube shows the nominal flow rate. The two yellow marks serve as aid to gauge the value of deviation. They are indicating values of approx. ± 10 % of the nominal flow rate.

Turntables and Telescope Supports

for supporting the specimens to determine the protection against water: *see prospectus P 17*

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PTL - Spray Nozzle

*for checking the protection against water to prove the degrees of protection **IPX3** "Protected against Spraying Water" and **IPX4** "Protected against Splashing Water"*

according to **IEC 60529** :2001-02 § 14.1 Tab. VIII, Fig. 5.

Standard outfit:

1 nozzle head, outside diameter 102 mm, radius 75.5 mm, with 121 holes of diameter 0.5 mm, in two parts, dismountable for cleaning,

1 moving shield with counterweight, removable, to screen all jets which deviate more than 60° from the vertical, independent of the nozzle direction,

1 handle, internal diameter approx. 15 mm, handle sleeve of plastic,

1 body with flow meter, measuring range 9 -10 - 11 l/min,

1 cock, as a flow control and stop valve, with hose connection,

1 hose, nominal width 19 mm (3/4"), 5 m long, with 2 hose clamps.

Design:

Nozzle head and some small parts of nickel-plated brass, all other metallic parts of stainless steel.

Article No. **P 05.24**

Flow meter:

The flow meter is a „gap meter“, working according to the principle of a variable area flow meter: A float with defined aperture is moving along a tapered pin. The higher the flow rate, the farther the float is moved. The counterforce is caused by a spring. For that the indication is almost independent from the position of the hose nozzle.

A black ring at the spring loaded float serves as a pointer. The green mark on the glass tube shows the nominal flow rate. The two yellow marks serve as aid to gauge the value of deviation. They are indicating values of approx. ± 10 % of the nominal flow rate.

Turntables and Telescope Units

for supporting the specimens to determine the protection against water: ***see prospectus P 17***

Oscillating Tube Units and Spray Chambers

for checking the protection against water, degrees of protection IPX3 and IPX4 "Protection against Spraying Water" resp. "Protection against Splashing Water" with semicircular oscillating tubes: ***see prospectus P 02 and P 18***

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PTL - Probes

for verification of the protection of persons and equipment by enclosures

according to **IEC 61032** :1997-12 + Corr.1 2003-01.

IP-Code-Probes of IEC 60529

Access probes

to verify protection of persons against access to hazardous live or mechanical parts.

Probe code	Fig. No.	Product picture	PTL designation	Remark	Article No.
A	1		IEC Test Sphere Ø 50 mm, with dynamometer 0...50 N		P 10.24
B	2		Jointed IEC Test Finger Ø 12 mm, insulated part 20 mm x Ø 50 mm x 100 mm	for 10 N: with P 10.34	P 10.14
C	3		IEC Steel Rod Ø 2.5 mm, with dynamometer 3 N		P 10.26
D	4		IEC Steel Wire Ø 1.0 mm, with dynamometer 1 N		P 10.27

Object probes

to verify protection of equipment against access ingress of solid foreign objects.

Probe code	Fig. No.	Product picture	PTL designation	Remark	Article No.
1	5		IEC Test Sphere Ø 50 mm, without handle	for 50 N: with P 10.35 + P 10.63 or P 10.24	P 10.22
2	6		IEC Test Sphere Ø 12.5 mm, without handle	for 30 N: with P 10.35 + P 10.63 or P 10.25	P 10.23

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PTL - Probes (continuation)

Other Access Probes

to verify protection of persons against access to hazardous live or mechanical parts.

Probe code	Fig. No.	Product picture	PTL designation	Remark	Article No.
11	7		Rigid Test Finger P 10.05, with dyna-mometer 0...50 N		P 10.38
12	8		Long Test Pin Ø 4 mm, 50 mm long	for 10 N: with P 10.34	P 10.02-S1
13	9		Short Test Pin Ø 3 mm / Ø 4 mm, 15 mm long		P 10.11
14	12		Test Bar 3 mm x 1 mm, 80 mm long, with dynamometer 20 N		P 10.12
15 / 16	-	-	-	*withdrawn*	-
17	11		Test Needle Ø 0.5 mm, 80 mm long		P 10.46-S1
18 / 19	12/13	www.ergonomicsusa.com	Small finger probes: Not in PTL pro-gram		n / a

to verify protection of persons against access to hazardous mechanical parts.

Probe code	Fig. No.	Product picture	PTL designation	Remark	Article No.
31	14		Test Rod Ø 25 mm, 80 mm long, conical stop	for 50 N: with P 10.35	P 10.55
32	15		Rod Ø 25 mm, 80 mm long ex-changeable: plastics for Test probe 31, metal for Test probe 32		
33	-	-	-	*withdrawn*	-

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PTL - Probes (continuation)

to verify protection of persons against access to hot or glowing parts.

Probe code	Fig. No.	Product picture	PTL designation	Remark	Article No.
41	16		Test Mandrel Ø 30 mm, 80 mm long including tip		P 10.03
42	-	-	-	*withdrawn*	-
43	17		Test Bar 50 mm x 5 mm, 175 mm long		P 10.57

▪ Accessories:

Product picture	PTL designation	Remark	Article No.
	Push and Pull Dynamometer, linear scale 0...10 N		P 10.34
	Push and Pull Dynamometer, linear scale 0...50 N		P 10.35
	Adapter Ø 12 mm / Ø 10 mm, between handle Ø 10 mm and P 10.3X		P 10.61
	Centre Adapter for P 10.22 or P 10.23 and P 10.3X		P 10.63
	Electrical Contact Indicator, 42 V AC 25 mA		P 10.28
	Test Sphere Ø 12.5 mm, with dyna-mometer 0...30 N	Alternatively for Test probe 2 Fig. 6	P 10.25

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PRÜFEINRICHTUNGEN TEST EQUIPMENT
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PTL - Dust Test Chamber

*for checking the protection against solid foreign objects to verify the degrees of protection **IP5X** "Dust-protected" and **IP6X** "Dust-tight"*

according to **IEC 60529** :2001-02 § 13.1 Tab. VII, Fig. 2.

Sence and purpose

Enclosures with the degree of protection IP5X "Dust-protected" do not have to prevent ingress of dust totally. However dust should not penetrate in an amount sufficient to interfere with the satisfactory operation of the equipment enclosed or to impair safety.

In the case of enclosures with degree of protection IP6X "Dust-tight", it is necessary to prove that no dust can penetrate into the inside of the enclosure.

Test equipment

The tests are carried out by means of a dust chamber with a sealed test cabinet, in which talcum powder is kept in suspension by means of an air stream. The talcum powder must be prepared in such a manner that it will pass through a sieve with a mesh size 0,075 mm.

The quantity of talcum given in the regulation is 2 kg per cubic metre test cabinet volume.

Test procedure

The enclosure under test is suspended in the test cabinet and connected to a vacuum pump. This produces inside the specimen a depression of maximum 2 kPa = 20 mbar (= approx. 200 mm water column) below atmospheric pressure.

The test is completed after 2 hours, if within 2 hours 80 to 120 times the air volume of the specimen has been drawn through.

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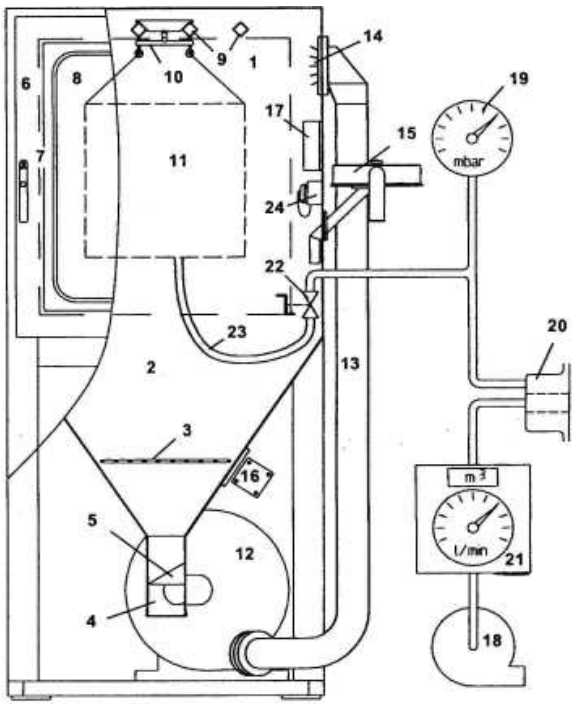
PTL - Dust Test Chamber (continuation)

Standard outfit:

1 test cabinet (1) with inner dimensions: width = 800 mm, height = 900 mm, depth depending on size, doorway: width = 660 mm, height = 760 mm, with solid door threshold suitable for supporting heavy specimens, dust catch channel outside beneath the door threshold,

1 to 3 funnel shaped bottoms (2), coarse mesh protective grids (3) to protect the dust circulation pumps from large parts, square shaped funnel drains (4) with removable bottom caps, with repellent sheets (5) above the intake openings to protect the dust circulation pumps from small solids,

1 to 2 cabinet doors (6), with locks and keys, with adjustable rubber seasl, with hinges and handle (7), surface of the window pane behind the door threshold, thereby scarcely any trickling of dust when the door is opened, window (8) of safety glass with hand-operated window wiper,



4 square slide rails (9) beneath the ceiling, with 1 or 2 slides (10), to suspend the specimen (11),

1 to 3 dust circulation pumps (12) with transfer pipes (13) and dust distribution outlets (14),

1 pressure compensation device (15) with exchangeable filter element,

1 to 3 electric vibrators (16) at the funnels, to remove dust deposition from the walls,

1 to 3 electric heating elements (17) inside of the test cabinet to keep the talcum powder dry to avoid agglomeration,

1 vacuum pump (18), to cause a depression inside of the specimen,

1 depression indicator (19), scale to -40 mbar,

1 dust filter (20) with exchangeable filter element, to collect the dust, which has been exhausted out of the specimen,

1 air volume meter (21) with pointer and counter,

1 vacuum connecting fitting with shut-off valve (22), with hose (23) to connect the specimen,

1 socket-outlet (24) inside of the test cabinet for energizing the specimen, two-pole with side earthing contacts according to CEE 7 Standard Sheet III, connectable to a separate voltage source, too.

In the control cabinet: main switch with EMERGENCY STOP function, key switch, switches for the functions each, bypass valve and admixture valve to adjust the airflow, programmable timer as Unit Timer for the complete installation, as Interval Timer for the socket-outlet and the circulation pumps and to control the vibration.

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PTL - Dust Test Chamber (continuation)

Selling sizes and outfit variants:

Product name	Test cabinet internal depth	Dust circulations	Rear door	Article No.
Dust test chamber 41	1 000 mm	1	no	P 14.41
Dust test chamber 41-2	1 000 mm	1	yes	P 14.41-2
Dust test chamber 42	1 200 mm	1	yes	P 14.42
Dust test chamber 44	2 000 mm	2	yes	P 14.44
Dust test chamber 45	2 400 mm	2	yes	P 14.45
Dust test chamber 46	3 000 mm	3	yes	P 14.46

Design:

Manufactured from rectangular stainless steel tubes and stainless sheet steel, outside sprayed with primer and with papyrus-white structure-varnish with stone-grey highlights, inside pickled,

control cabinet with control and monitoring elements located on the right-hand side, instrument board, control panel and base door of control cabinet made of anodized aluminium,

for connection to three-phase 3 x 400 V 50 Hz, mains connection cable 3 m with 5pole plug IEC 60309-2, Standard Sheet 2-II, 16 A 3 P + N + PE.

Rear door designed and equipped exactly like the front door, however mounted axially symmetrical to the front door in the rear wall.

▪ Accessories:

Three-phase Socket-outlet
for specimen (instead of 1-phase),
Article No. P 14.71

Talcumpowder
additional, for refill, 1 bucket with 10 kg,
Article No. P 14.82

Testing Sieve
to check the talcum powder, nominal width of mesh 0,075 mm.
Article No. P 14.83

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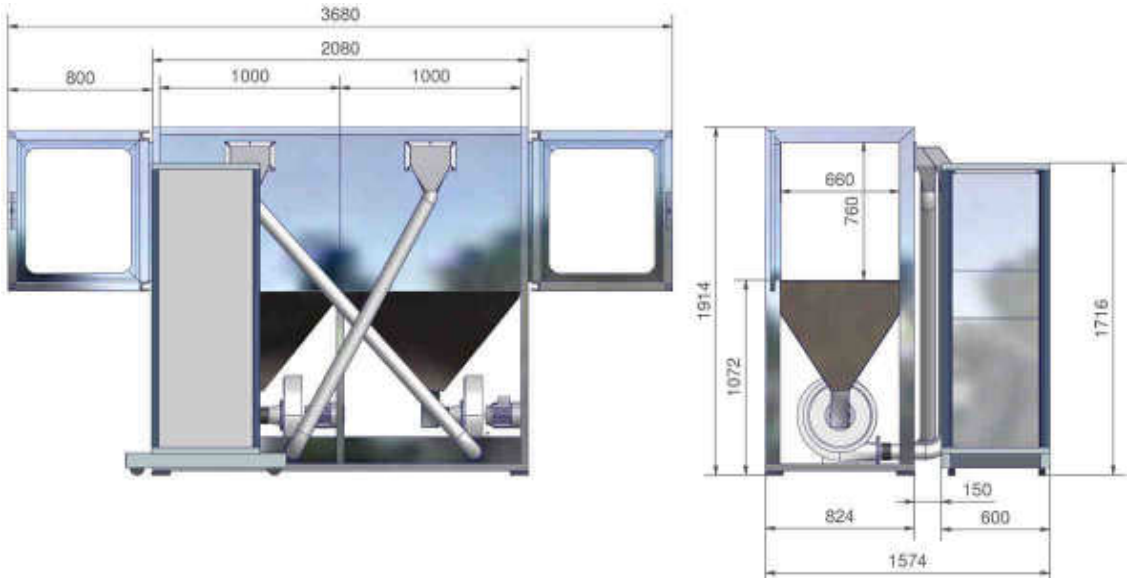
PTL - Dust Test Chamber (continuation)

Dimensions of Dust Test Chamber (for example P 14.44)



Internal depth: 2 000 mm, 2 sections at 1 000 mm each
Overall depth: with closed doors: 2 360 mm, with opened doors: 3 680 mm
Overall width: 1 574 mm
Overall height: 1 900 mm + 14 mm for Insulation plates as vibration dampers
Tolerance of all dimensions: ± 10 mm

Dephts of Dust Test Chamber:

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PTL - Turntable

to carry the specimens when determining the protection against water

according to **IEC 60529** :2001-02 § 14.1 Tab. VIII, Fig. 3.

Standard outfit:

1 tabletop with apron, circular, pivoted on a ball bearing turning rim, height of tabletop above floor approx. 220 mm,

1 frame with AC geared motor, with additional gear reduction to 1 (+0.1) rpm, with 4 height adjustable caster wheels, 2 of them lockable.

Design:

Tabletop with apron of aluminium, frame of stainless steel and papyrus-white structure varnished, for connection to 230 V 50 Hz (other voltages on request), including a 3 m long hard-wearing connection cable with waterproof plug.

Table diameter	Carrying capacity	Article No.
730 mm	150 kg	P 17.37
850 mm	150 kg	P 17.38
1 050 mm	150 kg	P 17.39

▪ Additional outfit:

Swivel Accessory unit

to change over from rotating operation to swivelling operation with reverse of direction after approx. 350°, absolutely necessary for specimens with connected cable.

Article No. P 17.44

▪ Attachment:

Telescope support

for fitting on a turntable, to hold the specimens

Standard outfit:

1 tubular stand, with mounting flange,
2 telescopic tubes, to clamp by tommy screws,
1 support grid, 270 mm x 180 mm, ± 30° inclinable, to clamp by a tommy screw.

Design:

All parts and screws of stainless steel, height of support grid above tabletop adjustable - unless otherwise agreed upon - from approx. 600 mm to 1 200 mm, carrying capacity maximally 50 kg.

Article No. P 17.47

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PTL - Spray Test Chamber

for checking the protection against ingress of water

PTL Spray Test Chambers are built in 2 different sizes: For Oscillating Tubes up to Radius **400 mm** and for Oscillating Tubes up to Radius **600 mm**.

Both sizes are available with each 3 different outfit bundles:

Radius up to 600 mm

Basic bundle

for checking the protection against ingress of water to verify the degrees of protection **IPX3** "Protection against spraying water" and **IPX4** "Protection against splashing water" according to **IEC 60529**:2001-02 § 14.1 Tab. VIII Fig. 4.

Radius up to 400 mm

B2 bundle

for additional intensified tests to prove the degree of protection **IPX4K** "Protection against Heavy Splashing Water with Increased Water Pressure“ according to **ISO 20653** :2013-02 § 6 Tab. 4 Fig. 1.

JIS bundle

for additional Rain tests **R1** / **R2** as well as Spray tests **S1** / **S2** accord. to **JIS D 0203** :1994-09 Tab. 1 Fig. 1

Radius up to	IEC 60529 (IPX3, IPX4)	ISO 20653 (IPX4K)	JIS D 0203	Article No.
400 mm	yes	-	-	P 18.22
400 mm	yes	yes	-	P 18.23
400 mm	yes	yes	yes	P 18.24
600 mm	yes	-	-	P 18.26
600 mm	yes	yes	-	P 18.27
600 mm	yes	yes	yes	P 18.28

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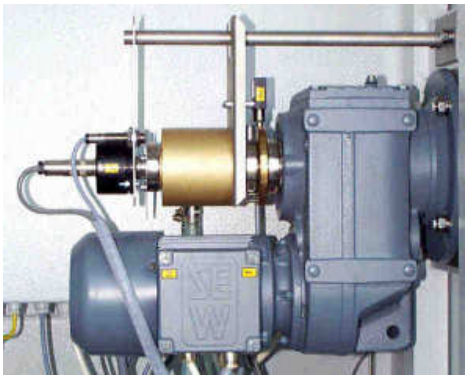
PRÜFEINRICHTUNGEN TEST EQUIPMENT
PTL Dr. Grabenhorst GmbH
DE-95343 Stadtsteinach P.O. BOX 12 53

PTL - Spray Test Chamber (continuation)

Basic bundle:

1 Drive Unit for Oscillation, with flanged shaft for mounting the oscillating tubes, three-phase geared motor for the oscillation speed 60 °/s, oscillation angle sensor and safety switch to switch off the drive as soon as the oscillation angle exceeds the admissible limit,



Drive unit

1 Test cabinet, left side wall, rear wall, ceiling and door with pane of security glass, door lockable, with screen wiper, with lighting, behind the threshold a water tank, with drain outlet connection for a hose,

1 Water system with water pump and further accessories for the water circulation up to 5 litres per minute, with flow regulation and flow indication, with filter,

1 Turntable upon the bottom, 150 kg load-carrying capacity at centric loading, with 1 rpm drive by geared motor, inclusive of device for switching over from rotating mode to oscillating mode with reversal of the direction of rotation at approx. 350°, necessary for specimens with supply cord,

1 Telescope support, of stainless steel, for mounting on the turntable, to support the specimens, carrying capacity 50 kg, support grid 180 mm x 270 mm, tilt able by ± 30°,

1 Control Cabinet, with Programmable control unit as a timer, with Position Indicating Instrument for the Oscillating Tubes, with Rotary knob “oscillation angle“, with Main switch to switch on and off the power for the chamber, with Emergency stop with key lock, with red push button “O“ to stop all operations, with green push button “ I “ to start the selected operations, with Rotary switch “TURNTABLE” to choose the mode “Swing“ or “Rotate“, with electronic controls for reversal of the oscillation.

Control cabinet

Design:

Manufactured from rectangular stainless steel tubes and stainless sheet steel, outside sprayed with primer and with papyrus-white structure-varnish with stone-grey highlights, inside pickled,

for connection to three-phase 3 x 400 V 50 Hz, mains connection cable 3 m with 5pole plug IEC 60309-2, Standard Sheet 2-II, 16A 3P + N + PE.

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PTL - Spray Test Chamber (continuation)

Additional outfit - B2 bundle:

1 **enforced Water system** with water pump and further accessories for the water circulation up to 17 (R max = 400 mm) respectively 25 (R max = 600 mm) litres per minute.

Additional outfit - JIS bundle:

1 additional Drive Unit at 45° for Rain and shower nozzles, rotation speed 23 rpm,

1 enforced Water system with water pump and further accessories for the water circulation up to 40 litres per minute,

1 Turntable Drive adjustable 1 to 17 rpm,

1 Rain Nozzle according to JIS D 0203: 1994 Fig. 1, with 2 slots 0.5 mm for tests R1 and R2,

1 Spray Nozzle according to JIS D 0203: 1994 Fig. 1, with 40 nozzles diameter 1.2 mm for tests S1 and S2.

Dimensions of Spray Test Chambers

External dimensions (w x d x h)	**Test cabinet dimensions** (app.)	**Doorway** (w x h)	**Turntable diameter**	**Article No.**
1 660 x	950 x	850 x	580 mm	P 18.22
1 100 x	950 x	850 mm		P 18.23
1 810 mm	950 mm			P 18.24
2 150 x	1 350 x	1 220 x	730 mm	P 18.26
1 600 x	1 350 x	1 360 mm		P 18.27
1 960 mm	1 350 mm			P 18.28

As PTL-Spray Test Chambers are tailor made, further options are possible. E.g. Drip Box for IPX1 and IPX2 in the ceiling or tunnel with Jet Nozzle IPX5 at the side. Especially for automotive sector: Connecting box for external test voltage, with programmable timer and socket outlets inside test cabinet.

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PTL - Spray Test Chamber (continuation)

▪ Accessories:

Oscillating Tubes

For chamber	Type	Radius [mm]	Ø nozzles [mm]	Number of nozzles +1	Distance centre to flange [mm]	Article No.
P 18.22	B1	200	0,4	12	475	P 02.67-25
	B1	400	0,4	25	475	P 02.68-05
P 18.23 and **P 18.24**	B1	200	0,4	12	475	P 02.67-25
	B1	400	0,4	25	475	P 02.68-05
	B2	200	0,8	12	475	P 02.77-25
	B2	400	0,8	25	475	P 02.78-05
P 18.26	B1	200	0,4	12	675	P 02.67-45
	B1	400	0,4	25	675	P 02.68-25
	B1	600	0,4	37	675	P 02.69-05
P 18.27 and **P 18.28**	B1	200	0,4	12	675	P 02.67-45
	B1	400	0,4	25	675	P 02.68-25
	B1	600	0,4	37	675	P 02.69-05
	B2	200	0,8	12	675	P 02.77-45
	B2	400	0,8	25	675	P 02.78-25
	B2	600	0,8	37	675	P 02.79-05

All tubes with 1 flange, tubes with radius 600 mm with 1 stud for end support bearing, center of the oscillating tube always in the center of the test chamber, delivery inclusive of 2 removable 30°-cover channels, each tube with 2 closures for rinsing.

Design: tubes, flanges and cover channels of stainless steel, nozzles of nickel-plated brass, with adjustable small tubes in a sheltered position.

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PRÜFEINRICHTUNGEN TEST EQUIPMENT
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PTL - Glow-wire Test

to determine the fire resistance by the fire hazard test

according to

IEC 60695-2-10 :2013-04
IEC 60695-2-11 (Glow-wire flammability test method - GWEPT)
IEC 60695-2-12 (Glow-wire flammability index - GWFI)
IEC 60695-2-13 (Glow-wire ignition temperature - GWIT)

Task

The test procedure is used to examine the fire resisting properties of products, if during the application or on the case of fault, heated or glowing parts (e.g. overloaded resistors) could be considered as a short-time ignition source.

Test apparatus

The ignition source is imitated by an electrically heated wire loop against which the sample is pressed with constant force. A miniature jacket thermocouple serves as a sensor for the loop temperature. The sample has to be fastened to a carriage on which, by means of fine wire ropes, weights with a force of 0,95 N is effective in the direction of the wire loop. Scales enable the reading of the flame height and the depth of penetration. Below the wire loop a board of pine wood, covered with a layer of tissue paper, is mounted. Thereby the danger of a fire spreading through burning drops or glowing parts falling from the sample can be judged.

Test method

The specimen shall be attached relative to the wire loop on such a way to represent the most unfavourable practical case. The scales of the measuring device shall be adjusted and the penetration depth of the loop shall be limited by the adjustable stop max. 7 mm). After returning the specimen the loop shall be heated up to the specified temperature.

When the loop has maintained the testing temperature for at least 60 seconds, the specimen can be led up to the loop. From the moment of contact, an operation time of exactly 30 seconds must be kept. The specimen is returned to its starting position and the depth is read. During and after the operation the burning behaviour of the specimen and the tissue paper on the wooden board has to be observed.

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PTL - Glow-wire Test (continuation)

According to **IEC 60695** the following test methods are to take into account:

Glow-wire flammability test method (GWEPT)

is the highest temperature at the test specimen is considered to have withstood this test if there is no ignition or the longest sustained and continuous flames or glowing of the test specimen after removal of the glow-wire, extinguish within 30 s and the specified layer of wrapping tissue is used there shall be no ignition of the wrapping tissue.

Glow-wire flammability index (GWFI)

is the highest temperature at the test specimen is considered to have withstood this test if there is no ignition or the longest sustained and continuous flames or glowing of the test specimen after removal of the glow-wire, extinguish within 30 s, the specimen is not totally consumed and there is no ignition of the wrapping tissue.

Preferred test temperatures [°C]	**Tolerances** [K]
500	± 10
550	± 10
500	± 10
650	± 10
700	± 10
750	± 10
800	± 15
850	± 15
900	± 15
960	± 15

Glow-wire ignition temperature (GWIT)

is the highest temperature at the test specimen is considered to have withstood this test if there is no ignition or if sustained and continuous flaming combustion does not occur for a time longer than 5 s for any single flame event and the specimen is not totally consumed.

Standard outfit:

1 glow-wire loop of nickel-chromium, with clamping mechanism,
1 carriage with multiple adjustable holding device for the specimen,
1 rail system with ground running surfaces,
1 pair of fine ropes with weights for the contact force of 0.95 N ± 0.1 N,
1 indicating device for the depth of penetration, with maximum pointer and stop,
1 scale to measure the flame height, multiple adjustable,
1 miniature jacket thermocouple type K (NiCr/NiAl), with plug almost free from thermo-electric voltage and with compensating lead (according to IEC 60584),
1 high current isolating transformer to heat the glow-wire loop, with series connected variable ratio transformer, to set the temperature up to 960 °C,
1 temperature indicating instrument to indicate the temperature of the glow-wire loop, with digital display, measuring range 0 to 1 000 °C, class 0.5, can be readjusted, with compensation of the ambient temperature,
1 Current indicating instrument for measuring the current of the glow-wire loop, with digital display, measuring range 0 to 160 A, class 1, with a current transformer.
1 housing, desk shaped, with all necessary electrical components, with key switch and 2 keys.

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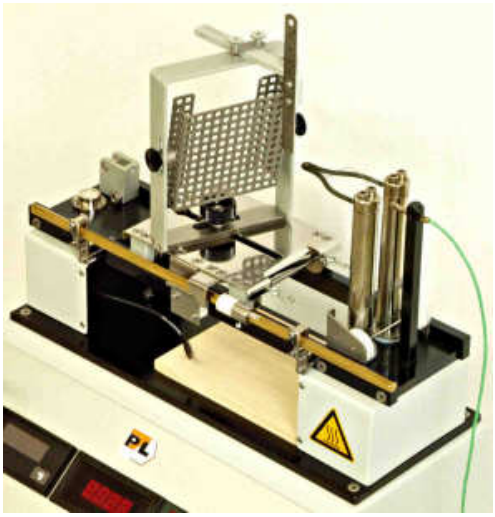
PTL - Glow-wire Test (continuation)



Motor drive

for moving the specimen to the wire loop, and for returning to the starting position.

As soon as the specimen contacts the loop, a coupling releases the carriage. After an operation time of exactly 30 seconds, the carriage is automatically returned. The test results are better reproducible, and the laboratory technician's attention is not diverted during the testing procedure by having to do various operation tasks. He can fully concentrate on the observation of the specimen.

Pulse timer with time display

to give an optical and a disengage able sound signal after 30 seconds each, and to indicate the testing time.

The pulse timer is started at the same time as the specimen contacts the glow-wire loop. By that, the indication of the time begins to run. The minutes and the seconds appear on the display. At the first signal, the specimen is returned and the glow-wire heating is automatically interrupted.

Design:

Testing device mounted on the housing of sheet steel, papyrus-white structure varnished, plan dimensions approx. 400 mm x 400 mm, total height approx. 650 mm, carriage and specimen holding device of corrosion-protected materials,

delivery including 2 cm^2 foil of fine silver 99.8 %, 0.06 mm thick, for calibration of the temperature indicating instrument, board of pine wood, 10 mm thick, wrapping tissue,

mains connection cord set for connection to 230 V AC, 50 to 60 Hz.

Article No. **T 03.35-10**

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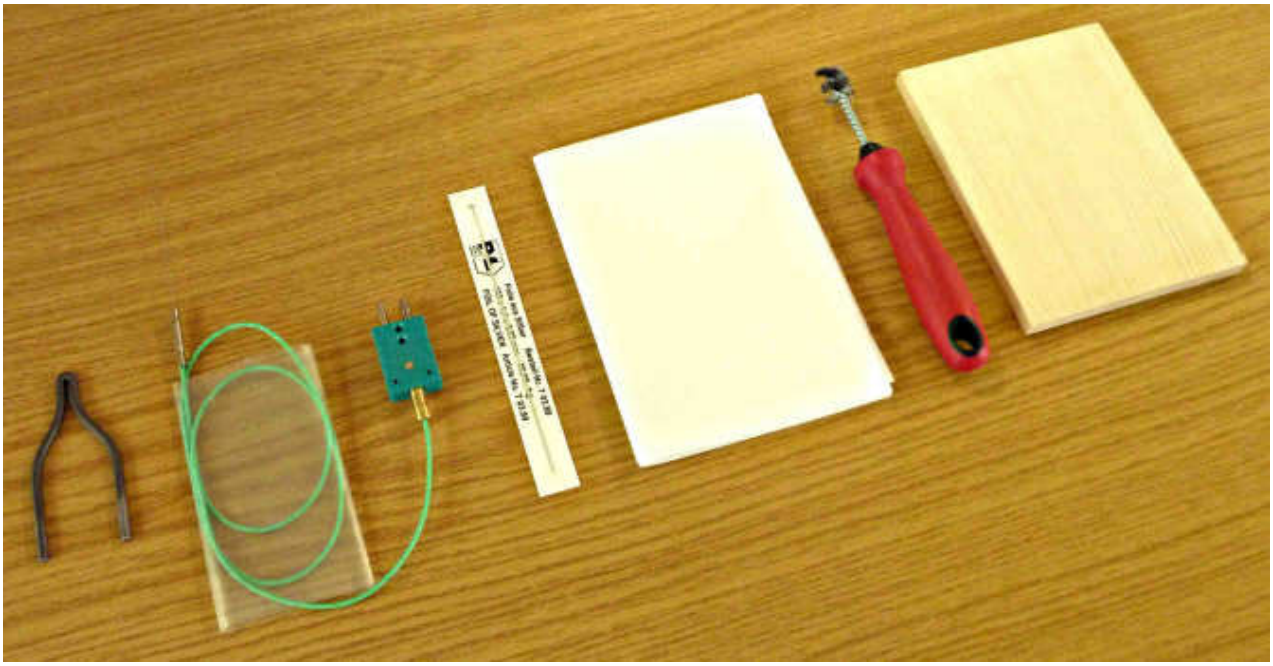
PTL - Glow-wire Test (continuation)

Spare parts:

		Article No.
Glow-wire Loop 1,0 mm	of nickel-chromium, NiCr 8020, material No. 2.4869, with bore hole Ø 1,1 mm, for the thermocouple 1,0 (T 03.84)	T 03.82
Miniature Jacket Thermocouple 1,0 mm	Type K (NiCr/NiAl), outer Ø 1,0 mm, length approx. 100 mm, with plug almost free from thermoelectric voltage and with comp. lead 500 mm long, for Glow-wire loop 1,0 (T 03.82)	T 03.84
Silver Foil, 2 cm²	0.06 mm thick, fine silver at least 99,8 %, for calibration of the temperature indicating instrument	T 03.89
Wrapping Tissue	20 g/qm, 10 sheets, each 50 cm x 70 cm	T 03.91
Fine Wire Brush	for cleaning glow wire loop	T 03.92
Board of Pine Wood	120 mm x 160 mm, 10 mm thick	T 03.93



The articles T 03.82 to T 03.93 are wearing parts without guarantee.

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PRÜFEINRICHTUNGEN TEST EQUIPMENT
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PTL - Temperature Measuring Board

to measure the temperatures in the bases or in the fixing surfaces for appliances in operation

according to **IEC 60335-1** :2010-05 § 11.2 -11.3.

Standard outfit:

1 Plywood board, 20 mm thick, with frame on all sides and with covering board at the lower side, together approx. 150 mm thick, with 4 feet,

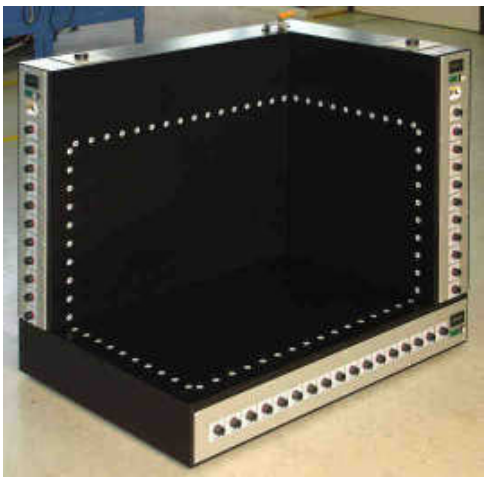
1 set measuring points consisting of:
copper disks, diameter 15 mm, 1 mm thick, embedded flush with the surface at distances of 50 mm x 50 mm in the plywood board,
and Fine-wire Thermocouples nickelchromium-nickel (NiCr-Ni), soldered to the back of the copper disks, thermoelectric wires with a diameter of 0,3 mm, insulated with temperature resistant material,

Temperature measuring board, 23 x 23 = 529 measuring points

1 set of change-over switches to select the lines resp. columns of the copper disks, to connect the selected copper disk with socket-outlet and temperature indicating instrument,

1 socket-outlet, two-pole, almost free of thermoelectric voltage, plug with cable of nickelchromium-nickel, length 1.5 m, for the connection of an external measuring instrument,

1 temperature indicating instrument, supplied by battery, with on/off switch.



Test corner, consisting of 2 Temperature measuring boards with 16 x 10 = 160 measuring points and 1 Temperature measuring board with 10 x 10 = 100 measuring points.

Design:

Plywood board, frame and copper disks varnished dull black, copper disk lines and columns marked.

Most Temperature Measuring Boards are tailor-made, the following Article Nos. are examples:

Measuring area in mm x mm	**Copper disks** lines x columns = quantity	**Article No.**
550 x 850	7 x 13 = 91	**T 06.09**
700 x 950	10 x 15 = 150	**T 06.15**
900 x 1 100	14 x 18 = 252	**T 06.25**
1 050 x 1 350	17 x 23 = 391	**T 06.39**

Other sizes of boards, thermocouple materials and arrangement of the copper disks, as well as stands, wall fastenings and measuring instruments: ***on request***

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PRÜFEINRICHTUNGEN TEST EQUIPMENT
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PTL - Ball Pressure Test Device

to determine the dimensional stability of parts consisting of non-ceramic, non-metallic insulating materials when exposed to higher temperatures up to maximum 250 °C

according to **IEC 60695-10-2** :2003-07,
necessary for tests according to e.g.:
IEC 60238, **IEC 60309-1**, **IEC 60320-1**, **IEC 60335-1**, **IEC 60598-1**, **IEC 60601-1**, **IEC 60669-1**, **IEC 60670-1**, **IEC 60745-1**, **IEC 60884-1**, **IEC 60950-1**, **IEC 60998-1**, **IEC 61058-1**, **IEC 61558-1**.

Standard outfit:

1 steel ball, diameter 5 mm,
1 ball holder, with bore and clamping screw for the bow,
1 bow, to hold the weights,
2 weights with fastening means,
1 specimen support, solid steel cylinder of 50 mm diameter and 100 mm in height with flat smooth mounting surface and bore hole for a thermocouple.

Design:

All parts made of stainless steel, steel ball of ball-bearing quality according to ISO 3290.

Test device:

Total mass 2 040 g ± 5 g to produce the pressing force of 20 N, weights carefully tared, total width approx. 340 mm, height approx. 130 mm.

Article No. **T 10.02**

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PRÜFEINRICHTUNGEN TEST EQUIPMENT
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PTL - Indentation Device 10

for pressure tests on plug pin insulating sleeves as well as on cords and cables with diameters up to 20 mm at temperatures up to 200 °C with loads up to 11.6 N

according to **IEC 60811-3-1** :1985-03 + A1:1994 + A2:2001 § 8.1.3,
VDE 0473-811-3-1 :2002-07 § 8.3.1, 8.2.3 Fig. 1.

Standard outfit:

1 base plate, dimensions of the floor space 100 mm x 150 mm,
1 stand, with support, with plane sample bearing surface,
1 testing frame, mass including blade 25.5 g, exerted load 0.25 N,
1 straight blade, hardened and ground, 0.7 mm + 0.01 mm thick, exchangeable,
1 load carrier, mass 25.5 g, for fitting the load weights, exerted load 0.25 N,
1 set of load weights, to load the sample with forces from 0.5 N to 11.6 N in steps of 0.01 N.

Design:

Small weight pieces of aluminium, all other parts of black-oxide-finished steel, bearing surface of the support ground, total height approx. 270 mm with sample diameter 20 mm.

Article No. T 13.10

▪ Alternatively:

Indentation Device 20

as above, but for simultaneous testing of 2 samples, with 2 testing frames, 2 load carriers and 2 sets of load weights, stand with bearing support T-shaped.

Article No. T 13.20

▪ Additional outfit:

Blade Rounded

with radius 6 mm according to IEC 60884-1 :2006-07 Fig. 41.

Article No. T 13.84

Indentation devices as multiple devices

for 3 or more samples: ***on request***

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PRÜFEINRICHTUNGEN TEST EQUIPMENT
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PTL - Low Temperature Ram Impact Test Apparatus 10

to determine the mechanical strength of insulated cords, cables, couplers, plug pin insulating sleeves and enclosures in the cold

according to **IEC 60670-1** :2011-07 § 15.1 Fig. 8 [a)],
IEC 60811-1-4 :1985 + A1:1993 + A2:2001 § 8.5, Fig. 2,
IEC 60884-1 :2013-02 § 24.4 Fig. 27 (and § 30.4 Fig. 42 [a)]).

[a)] *for this, intermediate piece Ø 6 mm, Article No. T 16.41, is required.*

Standard outfit:

1 steel block, height 40 mm, mass 10 kg,
2 columns, inclusive of upper crossbeam with fixing screw,
1 lower crossbeam, easy adjustment of height, with releasing lever for the falling weight,
1 guide rod, three-edged, with slightly rounded edges, for heights of fall up to 100 mm with maximum height of sample 40 mm,
1 intermediate piece of steel, diameter 20 mm, bottom side rounded R = 300 mm, mass 100 g.

Design:

steel block black-oxide-finished, all other parts of stainless materials, base 160 mm x 200 mm, total height approx. 450 mm without sponge rubber pad.

▪ Alternatively:

Article No. T 16.10

Low Temp. Ram Impact Test Apparatus 14

as above, however for heights of fall up to 300 mm with max. height of sample 70 mm total height without sponge rubber pad approx. 700 mm.

Article No. T 16.14

▪ Accessories:

Intermediate Piece

of steel, mass 100 g, with bolt of diameter 6 mm, length 20 (+1) mm.

Article No. T 16.41

Falling Elements pieces with collar for release, made of black-oxide-finished steel:

Weight	100 g	200 g	300 g	400 g	500 g
Article No.	**T 16.51**	**T 16.52**	**T 16.53**	**T 16.54**	**T 16.55**
Weight	600 g	750 g	1 000 g	1 250 g	1 500 g
Article No.	**T 16.56**	**T 16.57**	**T 16.58**	**T 16.59**	**T 16.60**

Complete Set consisting of 1 piece T 16.51 to T 16.60 each

Article No. T 16.70

Sponge Rubber Pad

as a base for the steel block, 40 mm thick, density 370 kg/m^3

Article No. T 16.71

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PTL - Surface Temperature Sensor

to determine surface temperatures up to 130 °C on kitchen ranges and similar appliances

according to **IEC 60335-2-6** :2008-03 § 11.101 Fig. 104.

Standard outfit:

1 thermocouple, soldered carefully to a disk of copper, 5 mm in diameter and 0.5 mm thick, thermocouple wires 0.3 mm - 0.1 mm in diameter,

1 tube, outer diameter 5 mm, inner diameter 3 mm,

1 handle with integrated spring, with mark to indicate the contact force 4 N,

1 compensating lead, with plug which is almost free from thermoelectric voltage, for connection to a temperature measuring instrument, with cord guard.

Design:

Thermocouple according to IEC 60584-1, type K (Chromel-Alumel, NiCr-NiAl), copper disk tinned, tube of polycarbonate, handle of stainless steel.

Article No. T 24.10

▪ Accessory:

Temperature Measuring Instrument

- hand-held,
- with LCD display of approx. 13 mm height,
- resolution up to 199.9 °C: 0.1 K,
- error up to 199.9 °C: ± 1 % referred to the measured value ± 4 digits,
- power supply by internal battery.

Article No. T 24.31

Firmensitz / DOMICILE: Industriestrasse 15, DE - 95346 Stadtsteinach
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PRÜFEINRICHTUNGEN TEST EQUIPMENT
PTL Dr. Grabenhorst GmbH
DE-95343 Stadtsteinach P.O. BOX 12 53

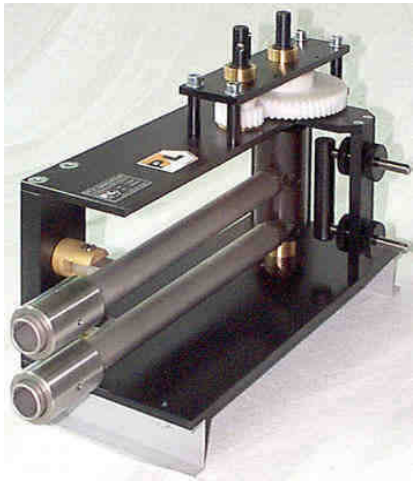
PTL - Cold-bend Test Apparatus

to determine the bending stability at low temperature of insulated cords and cables up to 12,5 mm diameter in cold test chambers or freezers with mandrels up to 50 mm diameter

according to **IEC 60811-1-4** :1985 + A1:1993 + A2:2001 § 8.1, 8.2, Fig. 1

Standard outfit:

1 rigid trestle,
1 driving shaft, with two bearings, with bush to take up the mandrel, with pivot for the actuating shaft,
1 gear, transmission 1:3, transmission shaft with two bearings, with pivot for the actuating shaft,
1 counter bearing for the mandrel, with quick acting closure,
1 guide bar, diameter 20 mm, distance to the mandrel adjustable,
1 to 3 metal tubes, horizontally and vertically swivel-mounted, distance of the swivel axis from the mandrel axis approx. 270 mm,
1 actuating shaft for attaching on the pivots, 450 mm long, with hand wheel.



Model T 26.20

Design:

Steel parts black-oxide-finished, all bearing bushes manufactured of brass, some small parts of stainless steel, total width maximally 235 mm, total length in direction of metal tube axis maximum 510 mm plus protruding sample.

Design of apparatus	Quantity of samples	lenght of mandrels	Metal tubes	Total height	Article No.
Single apparatus	1	80 mm	1	315 mm	T 26.10
Double apparatus	2	110 mm	2	345 mm	T 26.20
Triple apparatus	3	160 mm	3	395 mm	T 26.30

Accessories:

Bevel Gearing Attachment

to attach the actuating shaft horizontally.

Article No.	T 26.43

Metal Mandrels

made of steel, polished and black-oxide-finished, with bearing pivot and driving pivot, for T 26.10 with 1 radial bore hole (T 26.7**1**-XX), for T 26.20 with 2 radial bore hole (T 26.7**2**-XX) and for T 26.30 wit 3 radial bore holes (T 26.7**3**-XX), delivery including 1 to 3 appropriate guide nozzles.

Diameter	5	6,3	8	10	12,5	16	20	25	32	40	50
Article No.	T 26.7Y-51	-52	-53	-54	-55	-56	-57	-58	-59	-60	-61

Metal Mandrel Set, consisting of each 11 pieces, T 26.7Y-51 to T26.7Y-61,

for Single apparatus T 26.10, with 1 nozzle each,
for Double apparatus T 26.20, with 2 nozzles each,
for Triple apparatus T 26.30, with 3 nozzles each

Article No.	T 26.71
Article No.	T 26.72
Article No.	T 26.73

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PTL - Hot Set Test Apparatus 10

to determine the tensibility of insulating covering and coats of cables, wires and flexible cords when subjected to higher temperatures

according to **IEC 60811-2-1** :2001-11 § 9,
VDE 0473-811-2-1 :2002-09 § 9.

Quadruple-apparatus T 27.40

Standard outfit:

2 stands, with pedestals and a traverse for fixing the upper grip,

1 upper grip, for fixing the probe, with knurled screw,

1 measuring device, with vertical adjustable jaws and scale,

1 lower grip with knurled screw and a bore hole for attaching the weight holder, mass 51 g, tensile force 0.5 N,

1 weight holder to attach the tensile weights, mass 10.2 g, tensile force 0.1 N,

1 set of tensile weights, for applying the additional tensile forces 0.1 N to 10 N in steps of 0.1 N.

Design:

All parts of aluminium or of stainless steel, width approx. 205 mm, total height approx. 440 mm, depth approx. 120 mm.

Article No. **T 27.10**

▪ Alternatively:

Hot Set Test Apparatus 20, 30 and 40

as above, for the simultaneous test of two, three resp. four probes, with the according number of grips, measuring strips, weight holders and sets of tensile weights:

Design	Width	Article No.
Double test apparatus	280 mm	T 27.20
Triple test apparatus	400 mm	T 27.30
Quadruple test apparatus	520 mm	T 27.40

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PTL - Density Test Funnel Device

to determine the apparent density of moulding material consisting of powders or grains that can be poured from a specified funnel

according to **DIN EN ISO 60** :2000-01.

Standard outfit:

1 funnel, inner ∅ 56 mm with taper to ∅ 33 mm, capacity approx. 200 ml, inside surface highly polished,

1 drop bottom, with handle,

1 stand including base plate, with adjustable holder for the funnel,

1 measuring cylinder, inner diameter 45 mm ± 5 mm, capacity 100 ml ± 0.5 ml, inside surface highly polished,

3 spikes for a reliable electrically conductive connection between the measuring cylinder and the base plate,

1 bar with straight edges, for wiping.

Design:

Funnel, measuring cylinder, stand rod and drop bottom of corrosion resisting chromium-nickel steel, base plate and funnel holder of anodized aluminium.

Article No. V 32.02

The apparent density is determined to check manufactured and delivered moulding material. Knowledge of this density is a precondition for the calculation of loading chamber volumes of processing machines as well as of containers for storage and transport.

The apparent density is the ratio of mass and occupied volume. According to nature, the volume and thus the density considerably depend on the manner of pouring. For this reason the testing method was standardized; the PTL Density Test Funnel Device exactly complies to the relevant standards. In addition to the Density Test Funnel Device a precision balance is needed for determination of the mass.

PTL Density Test Funnel Devices have an electrically conductive connection between the funnel and the measuring cylinder to ensure potential equalization in case of electrostatic charges.

A Density Test Funnel Device can only be used for moulding material that can be poured from a specified funnel, i. e. powdery, granular or several short-fibre moulding materials. For long-fibre and shred-like moulding material, the apparent density is to determine in accordance with DIN EN ISO 61.

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PTL - Plastic Granule Pourability Funnel

for determining the pourability of granular plastics by measuring their time of pouring down and by observing the manner of pouring

according to **DIN EN ISO 6186** :1998-08 § 5 Fig. 1b).

Standard outfit:

1 funnel, bevel angle inside 40° ± 5', small inside diameter 30 mm + 0.1 mm, large inside diameter approx. 110 mm, with socket bore for an earth line,
1 union nut, knurled, for fixing one of the nozzles to the funnel,
1 base plate, with stand rod and holder for the funnel,
1 device for closing the funnel outlet, adjustable in height, (balance and stopwatch are not part of the standard outfit).

Design:

Funnel of stainless steel, union nut of nickel-plated brass, base plate and funnel holder of aluminium, base plate anodized, stand rod of stainless steel.

Article No.	V 36.42

▪ Additional outfit:

Nozzle

bevel angle inside 40°± 5', fitting to the funnel, of stainless steel:

Nozzle size	Diameter of the outlet	Height approx.	Article No.
No. 1	10 mm ± 0.01 mm	29 mm	V 36.45
No. 2	15 mm ± 0.01 mm	22 mm	V 36.46
No. 3	25 mm ± 0.01 mm	8 mm	V 36.48

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PTL - Response Angle Measuring Device (continuation)

for the determination of the angle of repose of powders and granules (formerly determination of the pourability as per Dr. Pfrengle)

according to **DIN ISO 4324** :1983-12.

Standard outfit:

1 funnel, large inside diameter approx. 140 mm, internal stem diameter 10 mm, total height 141 mm, installed agitator with handle and agitator rod,

1 stand, consisting of base plate and supporting rod for fixing the agitator, the funnel and the adjustable measuring slide, with millimetre scale to indicate the cone height,

1 vessel, diameter 100 mm, thickness 25 mm.

Design:

Funnel of glass, stand of steel, base plate anodized aluminium, vessel of transparent plastic, upper surface slightly rough.

Article No. **V 36.61**

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