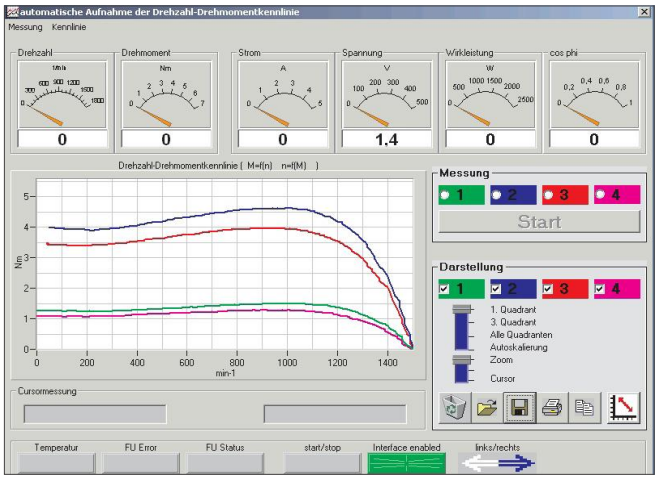
Electric Machines

Brake Unit with experimental machine

only limited pieces available, contact our service



Display of the characteristics speed / torque

Performed with the Software AC Machines Type 2734.4EVXX

With the training system „Electric Machines“ hps SystemTechnik offers a modern, newly developed program for plotting characteristics of:

- **DC machines**
- **AC machines**
- **Three-phase machines**

The system is composed of the following components:

- Control Unit
- Brake Unit
- Universal Power Supply
- Universal Resistor
- Electric Machines
- Universal Power Meter
- Interface for electric machines with software

Electric Machines

Series 2700

- **Training system for plotting characteristics of electric machines, manual and with PC**
- **Newly developed quick-action clamping device for experimental machines of shaft height of 63 mm, 71 mm and 80 mm**
- **Already existing machines, as well as usual commercial machines with one shaft end can be used**
- **Braking and driving of the experimental machines is done by a three-phase induction machine**
- **Universal Power Meter with seven-segment display and RS 232 interface**
- **The Universal Power Supply provides all voltages which are necessary for the experiments: AC, three-phase AC; fixed and adjustable DC**
- **The Universal Resistor as starter resistor, load resistor and field rheostat**

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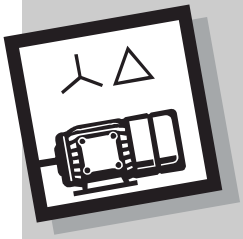


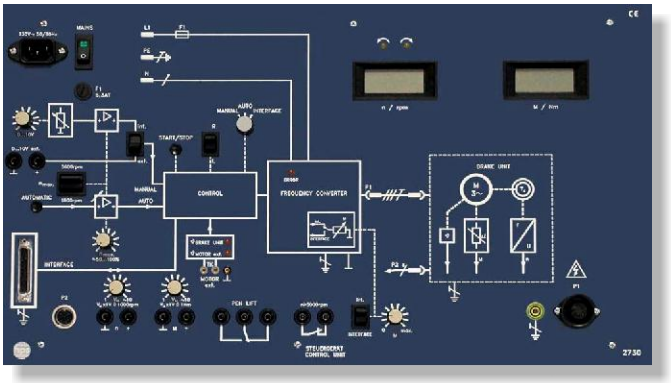
Control Unit
Brake Unit

Electric Machines

Control Unit

only limited pieces available

Type 2730



To conduct the experiments, Control Unit, Universal Power Supply and Universal Resistor are placed on a table or suspended in an hps bench rack for demonstration purposes.

The front panel of the units is made of 5 mm thick laminate, matt blue in colour with white printing representing the built-in function groups.

The rear is protected with a grey metal cover.

All function groups are wired through safety jacks (4 mm).

The Control Unit controls the three-phase induction motor of the Brake Unit (Type 2719).

It comprises:

- Frequency converter
- Control unit
- RPM display
- Torque display

Technical data

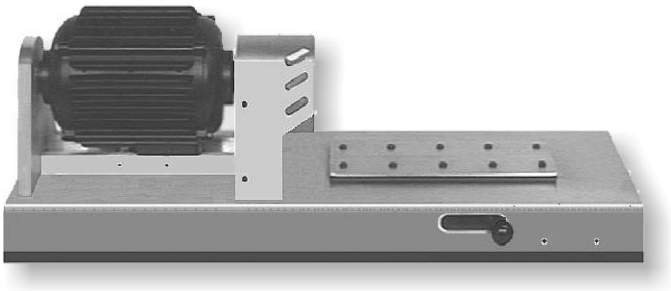
- Mains connection: 220 ... 230 V AC; 50 ... 60 Hz
- Working range of the Control Unit: 0.5 ... 120 Hz in both directions
- Dimensions: 532 x 297 x 185 mm (w x h x d)
- Weight: approx. 7.5 kg

Accessories included

- Connecting Lead, 4-pin (Type 2730.1)
- Connecting Lead, 8-pin (Type 2730.2)
- 2 Connecting Leads, 2 mm (Type 9103.4)

Brake Unit

Type 2719



The Brake Unit is composed of a suspended three-phase induction machine, a double cantilever beam with a full-bridge strain gage, a 2-channel encoder and a single-lever quick-action clamping device.

The three-phase induction machine is controlled in both directions via the frequency converter of the Control Unit in a speed range of about 15 … 3600 rpm. This allows braking and driving of the experimental machine.

Accessories included

- Coupling Collar (Type 2720.5)

Technical data

Three-phase induction machine

- Power: 400 W (at 50 Hz) 700 W (at 87 Hz)
- Protection through internal thermal contact

Torque measurement

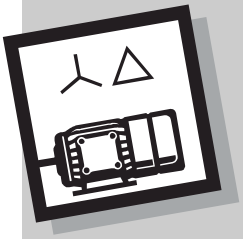
- With double cantilever beam, full-bridge strain gage and shielded amplifier module

Speed measurement

- 2-channel, optical
- 60 pulses / revolution

General

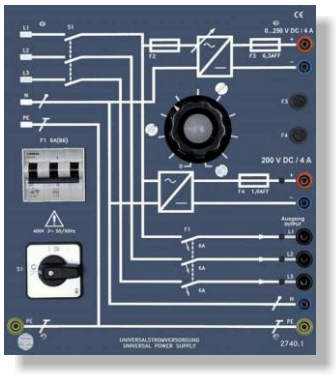
- Material of the base: stainless steel, brushed
- Dimensions / weight: 680 x 220 x 240 mm (w x h x d) / 15.1 kg



Universal Power Supply

UniversalResistor

Universal Power Supply — Type 2740.1

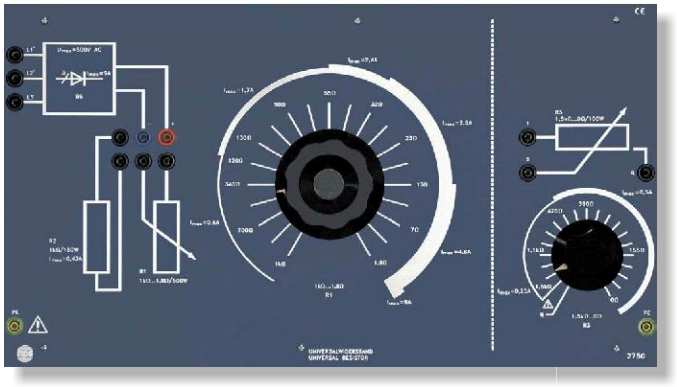


This power supply unit guarantees a clear experimental set-up and a short set-up time.

Technical data

- Mains connection, three-phase: 380 ... 415 V AC
- Outputs, three-phase: with phase pilot lamp and safety switch, 3-pole (6 A)
- Fixed DC: 200 V / 4 A (at 230 V mains) for field current supply of DC machines, with pilot lamp
- DC, continuously adjustable: 0 … 250 V/4 A
- Dimensions: 266 x 297 x 195 mm (w x h x d)
- Weight: approx 8.6 kg

Universal Resistor — Type 2750



The Universal Resistor carries out the following functions in conjunction with the electric machines:

- Starters and field rheostats for DC motors
- Field rheostats for DC generators
- Load resistors for DC generators
- Starting resistors for slipring motors
- Load resistors for synchronous machines

Technical Data

Ring rheostat, 500 W

- With protection series resistor: 1.8 /150 W
- With 5-step winding: 1.8 ... 11 /4.6 A
  11 ... 32 /3.5 A 32
  ... 56 /2.4 A
  56 ... 140 /1.7 A
  140 ... 1 k /0.6 A
- Additional series resistor, for expanding the resistance range: 1 k /180 W; I_{max} = 0.43 A
- Bridge rectifier: 3-phase, B6
  U_{max} = 500 V AC
  I_{max} = 9 A

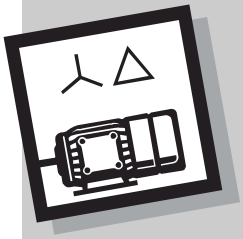
Ring rheostat, 100 W
(field rheostat)

- 0 ... 1.5 k , with 2-step winding and q-contact
- Steps: 0 ... 450 /0.5 A
  450 ... 1.5 k /0.25 A

The Universal Resistor is equipped with a bridge rectifier for loading of synchronous generators with the Ring rheostat (500 W).

The slipring voltage of the slipring motor can also be rectified by means of the bridge rectifier. Thus all possible steps of the slipring starter can be examined.

- Dimensions / weight 532 x 297 x 210 mm (w x h x d) / approx. 7.7 kg



Electric Machines

Electric Machines

Electric Machines of the hps Series 2700

General technical data:

- Terminal boards, imprinted with the respective symbols
- Connections: 4 mm safety jacks (thermal contact: 2 mm jacks)
- Painting: light grey (RAL 7035)
- All electric machines are provided with four machine feet and a coupling half.
- For protection against thermal overload all machines are equipped with thermal contacts.

Type 2701

Type 2702

Shunt-Wound DC Machine **Type 2701**
Power: 0.3 kW; speed: 2000 rpm; armature voltage and current: 205 V/2 A;
field voltage and current: 205 V/0.33 A;
dimensions: 290 x 160 x 215 mm (w x h x d); weight: 8.1 kg

Series-Wound DC Machine **Type 2702**
Power: 0.3 kW; speed: 2000 rpm;
armature voltage and current: 205 V/2.2 A;
dimensions: 290 x 160 x 215 mm (w x h x d); weight: 8.1 kg

Type 2703

Type 2704

Plain Compound DC Machine **Type 2703**
Power: 0.3 kW; speed: 1900 rpm; armature voltage and current: 205 V/1.8 A;
field voltage and current: 205 V/0.34 A;
dimensions: 310 x 165 x 215 mm (w x h x d); weight: 9.4 kg

Variable Compound DC Machine **Type 2704**
Power: 0.3 kW; speed: 2000 rpm; armature voltage and current: 205 V/2.3 A;
field voltage and current: 205 V/0.43 A;
dimensions: 315 x 170 x 220 mm (w x h x d); weight: 11.6 kg

Type 2705

Type 2706

Universal Motor **Type 2705**
Power: 0.3 kW; speed: 2250 rpm; AC voltage and current: 230 V/3.4 A;
DC voltage and current: 130 V/3.4 A;
dimensions: 310 x 165 x 215 mm (w x h x d); weight: 9,4 kg

Repulsion Motor **Type 2706**
Power: 0.25 kW; speed: 2100 rpm at 50 Hz; cos : 0.69;
AC voltage and current: 230 V/2.9 A;
dimensions: 280 x 190 x 210 mm (w x h x d); weight: 8,3 kg

Type 2707

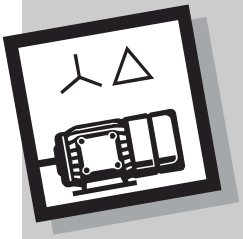
Type 2707.1

Three-Phase Induction Motor **Type 2707**
Power: 0.37 kW; speed: 1400 rpm at 50 Hz; cos : 0.72;
star connection: 692 V/0.58 A; delta connection: 400 V/1 A;
dimensions: 250 x 160 x 215 mm (w x h x d); weight: 7.1 kg

Three-Phase Induction Motor **Type 2707.1**
Power: 0.37 kW; speed: 1400 rpm at 50 Hz; cos : 0.72;
star connection: 400 V/0.85 A; delta connection: 230 V/1.47 A;
dimensions: 250 x 160 x 215 mm (w x h x d); weight: 7.1 kg

Electric Machines

Electric Machines of the hps Series 2700



Electric Machines

Type 2708

Type 2708.1

Slipring Motor **Type 2708**
Power: 0.25 kW; speed: 1340 rpm at 50 Hz; cos : 0.74;
star connection: 400 V/1.15 A; delta connection: 230 V/2 A;
dimensions: 280 x 160 x 215 mm (w x h x d); weight: 8.1 kg

Multifunction Machine **Type 2708.1**
Power: 0.27 kW; speed: 1340 rpm at 50 Hz; cos : 0.7 /1;
star connection: 400 V/0.83 A; delta connection: 230 V/1.44 A;
dimensions: 280 x 160 x 215 mm (w x h x d); weight: 8.1 kg

Type 2709

Type 2710

Dahlander Motor **Type 2709**
Power: 0.3/0.42 kW; speed: 1390/2780 rpm at 50 Hz; cos : 0.76/0.83;
delta connection: 400 V/1 A; dual star connection: 400 V/1.2 A;
dimensions: 250 x 160 x 215 mm (w x h x d); weight: 7.1 kg

Three-Phase Induction Motor (separate windings) **Type 2710**
Power: 0.15/0.22 kW; speed: 950/1450 rpm at 50 Hz; cos : 0.57/0.64;
star connection: 400 V/0.55 A; star connection: 400 V/0.6 A;
dimensions: 250 x 160 x 215 mm (w x h x d); weight: 7.1 kg

Type 2711

Type 2712

Synchronous Machine **Type 2711**
Power: 0.3 kW; speed: 1500 rpm at 50 Hz; cos : 0.97; excitation current:
0,95 A; star connection: 400 V/0.66 A; delta connection: 230 V/1.44 A;
dimensions: 280 x 160 x 215 mm (w x h x d); weight: 8.3 kg

Bifilar Wound Motor **Type 2712**
Power: 0.22 kW; speed: 1360 rpm at 50 Hz; cos : 0.69;
AC voltage and current: 230 V/2.8 A;
dimensions: 250 x 160 x 215 mm (w x h x d); weight: 7.1 kg

Type 2715

Type 2716

Capacitor Motor **Type 2715**
Power: 0.3 kW; speed: 1425 rpm at 50 Hz; cos : 0.93; AC voltage and
current: 230 V/2.1 A; phase-shift and starting capacitor: 10 F/14 F;
dimensions: 240 x 170 x 230 mm (w x h x d); weight: 7.3 kg

Split-Pole Motor **Type 2716**
Power: 0.12 kW; speed: 2700 rpm at 50 Hz; cos : 0.6;
AC voltage and current: 230 V/3.2 A;
dimensions: 240 x 170 x 230 mm (w x h x d); weight: 7.3 kg

Electric Machines

Sectional Models

...**-SM** = Sectional Model (Fan housing not cutted)

...**-SM-L** = Sectional Model (Fan housing cutted)

Type 2701-SM

Type 2701-SM-L

Sectional Model Shunt-Wound DC Machine **Type 2701-SM**
Shaft height: 71 mm; the machine is painted light grey; blank parts are coated with a clear varnish to inhibit corrosion;
Fan housing not cutted.
Dimensions: 303 x 141 x 142 mm (w x h x d); weight: 7.4 kg

Sectional Model Shunt-Wound DC Machine **Type 2701-SM-L**
Shaft height: 71 mm; the machine is painted light grey; blank parts are coated with a clear varnish to inhibit corrosion;
Fan housing cutted.
Dimensions: 303 x 141 x 142 mm (w x h x d); weight: 7.4 kg

Type 2707.1-SM

Type 2707.1-SM-L

Sectional Model Three-Phase Induction Motor **Type 2707.1-SM**
With round-bar rotor; shaft height: 71 mm; the motor is painted light grey; blank parts are coated with a clear varnish to inhibit corrosion;
Fan housing not cutted.
dimensions: 273 x 141 x 142 mm (w x h x d); weight: 7.2 kg

Sectional Model Three-Phase Induction Motor **Type 2707.1-SM-L**
With round-bar rotor; shaft height: 71 mm; the motor is painted light grey; blank parts are coated with a clear varnish to inhibit corrosion;
Fan housing cutted.
dimensions: 273 x 141 x 142 mm (w x h x d); weight: 7.2 kg

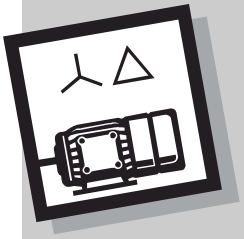
Type 2708-SM

Type 2708-SM-L

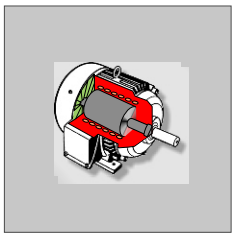
Sectional Model Three-Phase Induction Motor **Type 2708-SM**
With slipring rotor; shaft height: 71 mm; the motor is painted light grey; blank parts are coated with a clear varnish to inhibit corrosion;
Fan housing not cutted.
dimensions: 273 x 141 x 142 mm (w x h x d); weight: 7.9 kg

Sectional Model Three-Phase Induction Motor **Type 2708-SM-L**
With slipring rotor; shaft height: 71 mm; the motor is painted light grey; blank parts are coated with a clear varnish to inhibit corrosion;
Fan housing cutted.
dimensions: 273 x 141 x 142 mm (w x h x d); weight: 7.9 kg

Sectional Models



Electric Machines

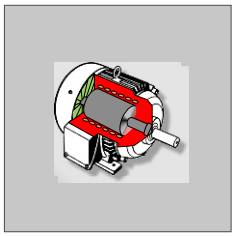


Type 2711-SM

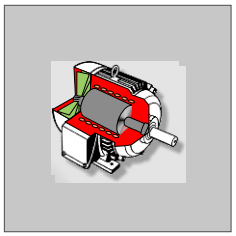
Type 2711-SM-L

Sectional Model Synchronous Machine **Type 2711-SM**
Shaft height: 71 mm; the machine is painted light grey; blank parts are coated with a clear varnish to inhibit corrosion;
Fan housing not cutted.
dimensions: 273 x 141 x 142 mm (w x h x d); weight: 7.6 kg

Sectional Model Synchronous Machine **Type 2711-SM-L**
Shaft height: 71 mm; the machine is painted light grey; blank parts are coated with a clear varnish to inhibit corrosion;
Fan housing cutted.
dimensions: 273 x 141 x 142 mm (w x h x d); weight: 7.5 kg



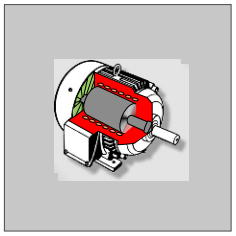
Type 2711.1-SM



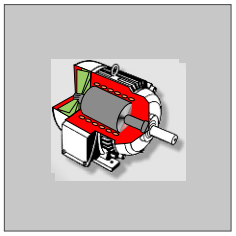
Type 2711.1-SM-L

Schnittmodell Synchronmaschine **Typ 2711.1-SM**
(Schenkelpolläufer)
Bauhöhe: 71 mm; alle Schnittflächen sind zum Schutz vor Korrosion mit Klarlack überzogen;
Lüftergehäuse nicht geschnitten
Abmessungen: 273 x 141 x 142 mm (B x H x T); Gewicht: 7,9 kg

Schnittmodell Synchronmaschine **Typ 2711.1-SM-L**
(Schenkelpolläufer)
Bauhöhe: 71 mm; alle Schnittflächen sind zum Schutz vor Korrosion mit Klarlack überzogen;
Lüftergehäuse zusätzlich geschnitten
Abmessungen: 273 x 141 x 142 mm (B x H x T); Gewicht: 7,9 kg



Type 2711.2-SM



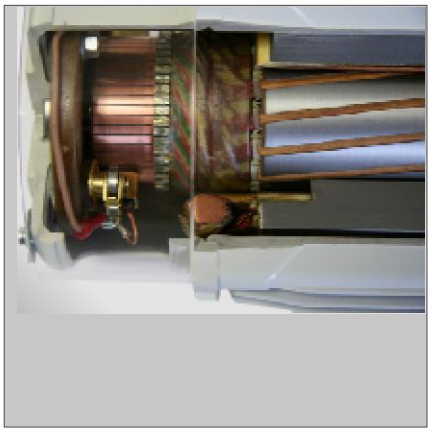
Type 2711.2-SM-L

Schnittmodell Synchronmaschine **Typ 2711.2-SM**
(Schenkelpolläufer)
Bauhöhe: 71 mm; alle Schnittflächen sind zum Schutz vor Korrosion mit Kla lack überzogen;
Lüftergehäuse nicht geschnitten
Abmessungen: 273 x 141 x 142 mm (B x H x T); Gewicht: 7,9 kg

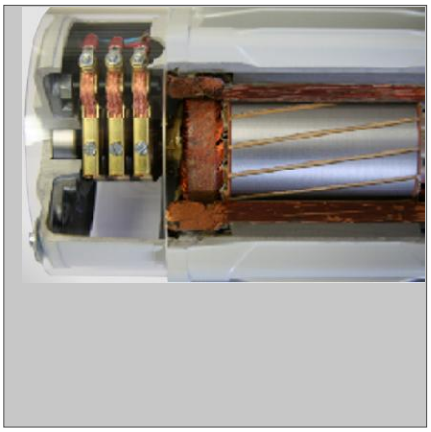
Schnittmodell Synchronmaschine **Typ 2711.2-SM-L**
(Schenkelpolläufer)
Bauhöhe: 71 mm; alle Schnittflächen sind zum Schutz vor Korrosion mit Klarlack überzogen;
Lüftergehäuse zusätzlich geschnitten
Abmessungen: 273 x 141 x 142 mm (B x H x T); Gewicht: 7,9 kg

Electric Machines

Sectional Models

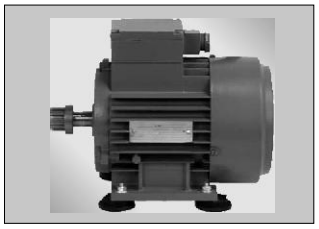


Detailed Illustration Type 2701-SM-L



Detailed Illustration Type 2708-SM-L

Industrial machines with machine feet and coupling half



The use of machines of other training programs as well as of standard industrial machines is also possible.

The appropriate machine feet (Types 2720.1, 2720.2, 2720.3) are available for this purpose.

A prerequisite is however a standard shaft height of 63 mm, 71 mm or 80 mm.

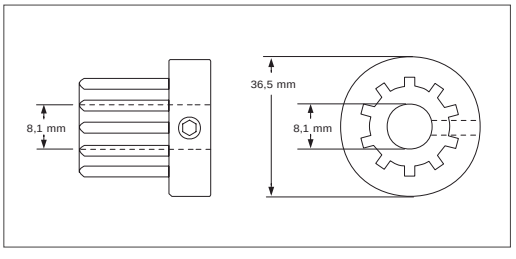
Furthermore the suitable coupling half (Type 2720.4) has to be mounted.

Machine feet

4 pieces in a set, each of which with one screw, nut, large diameter washer and tooth lock washer; for adaptation of standard machines in height and width to the Brake Unit.
Machines of a width of 100 mm or more (distance of mounting hole) can be adapted directly through the machine feet with eccentrical drilling hole.

The machine feet are available in three heights.
Height 12 mm (for machines of 80 mm shaft height): **Type 2720.1**
Height 21 mm (for machines of 71 mm shaft height): **Type 2720.2**
Height 29 mm (for machines of 63 mm shaft height): **Type 2720.3**
Diameter: 45 mm; material: synthetic, glass-fibre reinforced

Coupling Half, (schematic diagram) Type 2720.4



The coupling half is fixed on the shafts of the machines with a hexagon socket screw.

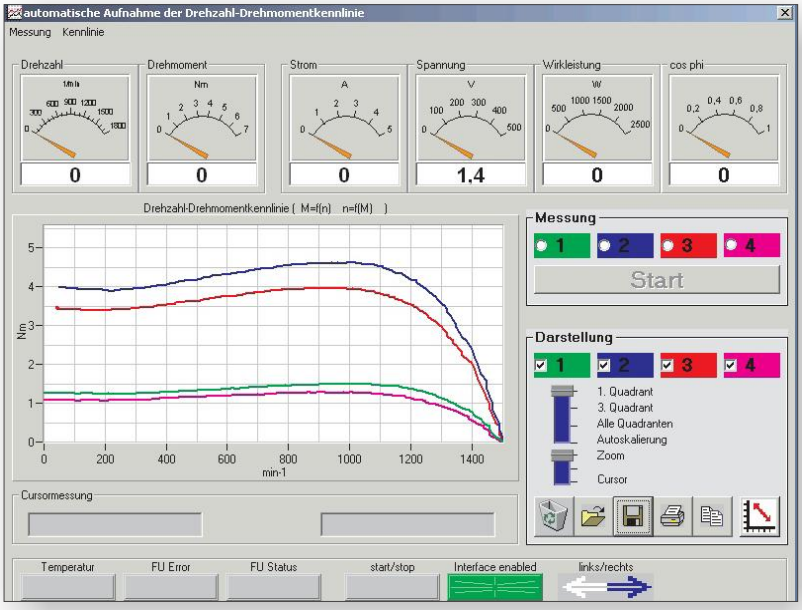
The drilling hole of the coupling half has a standard diameter of 8.1 mm. Other diameters (8.1 mm ... 15.9 mm) can also be supplied on request.

Length: 30 mm, diameter: 36.5 mm, material: sintered iron

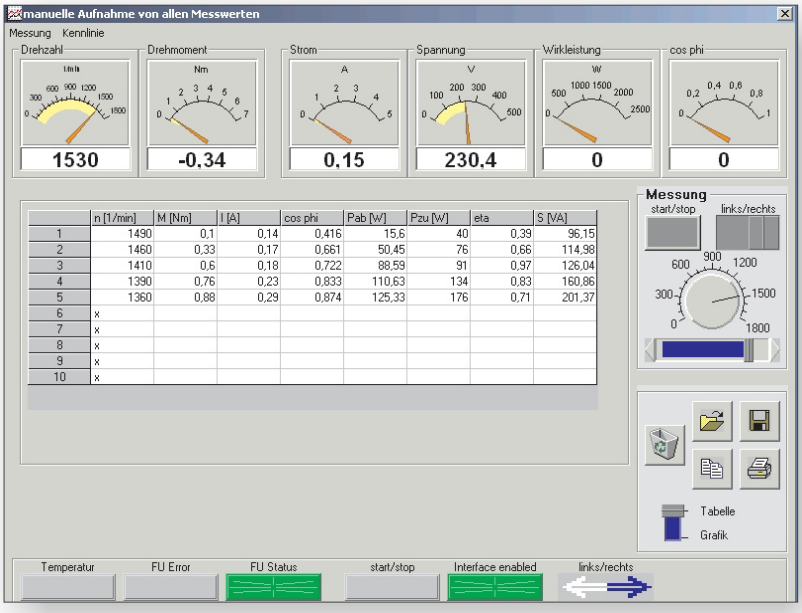
Electric Machines

Software AC Machines / DC Machines

Type 2737.4EVXX



Display of the characteristics speed / torque



Display of different measuring values of an asynchronous motor (analog and digital)

PC Link Electric Machines

With the software

- **AC Machines**
- **DC Machines**

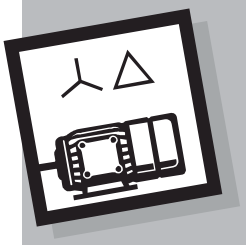
the load of AC and DC machines can be controlled comfortably with the PC in connection with the hps devices

- **Control Unit**
- **Brake Unit**
- **Universal Power Meter**

The following individual settings can be made on the PC:

- **Start / stop**
- **Right / left rotation**
- **Speed**
- **Brake ramp**
- **Setpoint value**
- **Torque**

Required hardware overleaf



PC Link Accessories Recommended

The measuring values of speed and torque are gener ated for the PC with the PCI-I/O Card or the USB INTER-FACE.

In connection with the Universal Power Meter from hps SystemTechnik additional measuring values such as voltage, current and power can be fed to the PC through a serial interface.

The software AC Machines/ DC Machines enables all the necessary calculations of the fed measuring values.

The read-in measuring values and all calculated values are shown in analog or digital form on the screen.

Electric Machines

USB INTERFACE — Type 2737

- **ANALOG DIGITAL I / O**
  25-pin Sub-D jack for connection to hps Control Unit Type 2730
- **USB**
  Connection to PC
- **Mains connection**
  220 V AC ... 240 V AC; approx. 15 VA; 50 ... 60 Hz
- **Dimensions / weight**
  133 x 297 x 110 mm (w x h x d) / 1.4 kg
- **PC requirements**
  IBM-compatible PC with Windows 98 / 2000 or XP, Vista, WIN 7, free USB interface and free serial interface
- The quality of the characteristics generated with the USB INTERFACE is minor compared to those generated with the PCI-I/O Card due to the lower number of measuring values.

Accessories Required for Training System Electric Machines

- Meters: Multimeter, phase-angle meter, UNIVERSAL POWER METER (Type 1091)
- Safety connecting plugs and leads
- Experiment manual: Electric Machines (Type V 0170)

for PC link

- IBM-compatible PC

Subject to technical modifications.