

## ■ Balancers.

FEIN Balancers increase operating convenience and safety when working with power tools and heavy power driven equipment.

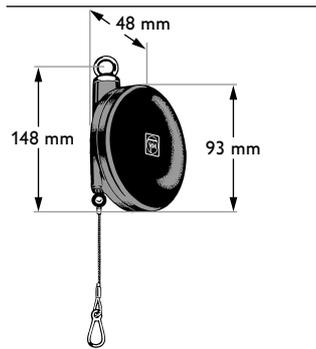
Suspending tools on the balancers makes them “weightless” and means they can be freely moved. The extended lengths of the cable hangers provide a large operating radius. Weights range from 0,5 to 60 kg. Utilising the spiral cable any Power tool up to 16 A may be plugged into the socket on the balancer. Unused cable is never in the way.

### AT A GLANCE

- Tools become “weightless”.
- A tidy work area.
- Equipment and tools always ready to hand.
- Suspending tools and cables increases work-area safety.
- Equipment is within sight and reach of the operator.
- The weight compensation can be adjusted for optimum balance over the entire length of the cable extension.



## ■ Balancer, up to 2.5 kg load



### Technical Data

Variable load kg	Factory setting kg	max. stroke m	Net weight kg	Order Reference
0,5–1,5	1	0,9	0,35	9 08 01 012 00 8
1,5–2,5	1	0,9	0,35	9 08 01 023 00 1

Safe suspension of device and power line in „weightless“ state.

- Small size.
- Constant traction.
- Easily adjustable.

Recommended Accessories:

#### Spiral cordset

for electric tools with mains connection cables of quality HO 5 RN-F 2x1.

**Order Reference** 3 07 07 157 01 3



## ■ Balancer, up to 17 kg load



### Technical Data

Variable load kg	Factory setting kg	max. stroke m	Net weight kg	Order Reference
1–3	2	2	3,2	9 08 01 024 00 9
2,5–5	3,5	2	3,2	9 08 01 025 00 3
3,5–6,5	5	2	3,2	9 08 01 026 00 6
4,5–9	7	2	3,2	9 08 01 027 00 0
7,5–11,5	9	2	3,2	9 08 01 028 00 8
10–14	12	2	3,2	9 08 01 029 00 2
13,5–17	15	2	3,2	9 08 01 030 00 4

Safe suspension of device and power line in „weightless“ state.

Recommended Accessories:

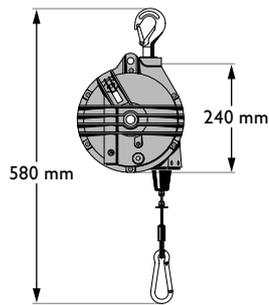
#### Spiral cordset

for electric tools with mains connection cables of quality HO 5 RN-F 2x1.

**Order Reference** 3 07 07 157 01 3



# ■ Balancer, up to 60 kg load



### Technical Data

Variable load kg	Factory setting kg	max. stroke m	Net weight kg	Order Reference
13-25	15	1,9	7,0	<b>9 08 01 048 00 6</b>
22-32	25	1,9	7,0	<b>9 08 01 049 00 0</b>
30-45	40	1,9	18,0	<b>9 08 01 050 00 2</b>
45-60	50	1,9	18,4	<b>9 08 01 051 00 1</b>

Safe suspension of device and power line in „weightless“ state.

- Constant traction.

### Recommended Accessories:

#### Spiral cordset

for electric tools with mains connection cables of quality HO 5 RN-F 2x1.



**Order Reference 3 07 07 157 01 3**

#### Locking device

for fixing the extended cable. Facilitates the exchange of the suspended tool.



**Order Reference 3 02 40 239 01 4**

#### Swivel hook

For attaching to rope eye. Stops the rope twisting.



**Order Reference 3 02 32 044 01 0**



## ■ FEIN Dust Extractors.

FEIN dust extractors are equipped with an automatic under-pressure control device, which effectively prevents the dust filter bag from becoming excessively full.

The extractors not only reliably remove any dust that may be in the vicinity, they also ensure it is collected and disposed of in an environmentally friendly manner.

Both dust extractors are suitable for use under both wet as well as dry conditions. The extractor's own power socket can be used to connect power tools with dust extraction. The extractors are then switched on and off automatically together with the connected power tool.

## Vacuum cleaner 1300 W

### FEIN "Dustex II"

<b>Order Reference</b>		<b>9 20 20</b>
Input	W	1300
Air flow	l/min	3300
Max. underpressure	mbar	230
Container volume	l	24
Socket connection max.	W	2000
Net weight	kg	7
Cable with plug	m	6

#### Price includes:

1 suction hose, 5 m, Ø 36 mm, 1 floor nozzle, 2 extension pipes, 1 groove nozzle, 1 upholstery nozzle, 1 adapter for FEIN power tools, 1 universal power tool adapter, 1 filter bag



### AT A GLANCE

- The ideal addition to the FEIN MULTIMASTER.
- Compact size.
- Optimally suited for shop, car, hobby or as auxiliary tool.
- For wet or dry conditions.
- For little to medium amounts of dust.
- Automatic on/off.

Accessories on page 239.

## Vacuum cleaner 1200 W

### automatic switch-on facility

<b>Order Reference</b>		<b>9 20 18</b>
Input	W	1200
Air flow	l/min	3600
Max. underpressure	mbar	230
Container volume	l	38
Safety class	acc. VDE 0740, T1/205	I
Fuse protection	splash-proof	IPX4
for soft screwdriving operation, approx.	non-stop operation	S1
Socket connection max.	W	2400
Cable with plug	m	7,5
Net weight	kg	12,0

#### Price includes:

1 Suction hose, 3.5 m, Ø 32 mm



### AT A GLANCE

- For wet or dry conditions.
- Usage category "U", also for vacuuming deposited dust.
- Infinitely variable speed regulation (suction limitation)

Accessories on page 239.

### for Dustex II

#### Filter cartridge

Order Reference 3 13 22 765 00 9

#### Paper filter

Pack of 5

Order Reference 3 13 22 781 01 7

BIA tested, 5-pack

Order Reference 3 13 22 757 01 6

### for 9 20 18

#### Filter element



Order Reference 3 13 22 600 00 1

#### Filter bag

Pack of 5



Order Reference 3 13 22 599 01 5

#### Suction hose

with hose sleeve and adapter



Ø	Length	Order Reference
mm	m	
27	3,5	3 14 14 024 01 0
32	5	3 14 14 016 02 4
32	10	3 14 14 019 01 4

#### Suction hose, anti-static

with hose sleeve and adapter

Ø	Length	Order Reference
mm	m	
27	3,5	3 14 14 041 01 3
32	3,5	3 14 14 058 01 6
32	5	3 14 14 030 01 5

#### Hose sleeve

for connecting hose to dust extractor



Ø	Order Reference
mm	
27	3 13 22 294 00 5

for anti-static suction hose

Ø	Order Reference
mm	
27	3 13 22 290 00 1
32	3 13 22 296 00 2

#### Adapter

for connecting hose to dust extractor



Ø mm	Order Reference
58→27	3 13 22 295 00 9
58→32	3 13 22 080 00 7

for anti-static suction hose

Ø mm	Order Reference
58→27	3 13 22 291 00 0
58→32	3 13 22 238 00 0

#### Connecting piece

Ø 58 mm, required for connecting together 2 suction hoses



Order Reference 3 13 22 235 00 5

#### Spark catcher

for suction hose Ø 32 mm



Order Reference 3 13 22 489 00 1

#### Suction force reducer

PVC, Ø 58 mm



Order Reference 3 32 18 019 01 2

#### Three-way connector

PVC with 3 internal tapers, 58 mm Ø



Order Reference 3 13 22 078 00 1

For connection to the vacuum cleaner the direct connection part 3 13 22 079 00 5 is required.

#### Direct connector

PVC, Ø 58 mm, required for connecting 2 tools with three-way connector



Order Reference 3 13 22 079 00 5

#### Sealing section

PVC, Ø 58 mm, for sealing a three-way connector



Order Reference 3 13 22 081 00 6

#### Swivel connector

curved, chrome plated, Ø 36 mm → 32 mm



Order Reference 3 13 22 082 00 9

The rotary connection fits onto suction hoses with Ø 32 mm only with hose connection 3 13 22 169 00 5. It is needed for all accessories with Ø 36 mm connections.

#### Hose sleeve

for suction hood, for connection the suction hose



Order Reference 3 13 22 169 00 5

#### Extension tube

Straight, chrome plated, connection 36 mm Ø, 950 mm long

Order Reference 3 13 22 083 00 3

#### Crevice nozzle

Polystyrene 36 mm Ø connection



Order Reference 3 13 22 087 00 2

Further accessories  
see page 240.

**Inclined tube nozzle**

Rubber, 36 mm Ø connection

**Order Reference 3 13 22 084 00 1****Universal nozzle**

Aluminium, 36 mm Ø connection

Working width 120 mm

**Order Reference 3 13 22 088 00 0****Special floor nozzle**

PVC, 36 mm Ø connection Working width 400 mm, height adjustment for dry and wet suction

**Order Reference 3 13 22 085 00 5****Rubber lips**

for floor nozzle 3 13 22 085 00 5

**Order Reference 3 13 22 086 00 8****Brush nozzle**

PVC, 36 mm Ø connection

**Order Reference 3 13 22 089 00 4**

## Carrying Case, metal.



for types:

	Order References	Fig.	Length approx. mm	Width approx. mm	Height approx. mm
DSk(e) 658-1; DSke 672; DDSk 672(-1); ASb(e) 647-1; ASb(e) 648; ASb 658-1; MSs 641 a/b; ASte 649;	<b>3 39 01 032 01 3</b>	1	400	400	130
ASy 630; ASye 636; ASke 636; ASkeu 636; DSke 636; DSkeu 636; DSeu 638; DSceu 638; ASzxeu 636-1; ASse 636; SCU 7-9; DSse 642; SCS 4.8-25; SCS 6.3-19 T; SCT 5-40; SCT 5-40 U; SCT 5-40 M; SCT 6-25; ASsde 630; ASb 636; ASbe 642; ASge 636; AHSI 636 c; MSh 635; MSh 636-1; UBS 1.6; UBS 2.0; BLS 1.6 X; BLS 2.5; RSs 636-2; BLK 1.6; RSs 636-4; RSs 638-5; ASst(e) 638;	<b>3 39 01 067 01 3</b>	2	390	240	110
WSG 20-180; WSG 20-230; WSB 20-180; WSB 20-230; WSB 25-180 X; WSB 25-230 X; ASstxe 2203; ASstx(e) 649; MOt 6-18-2;	<b>3 39 01 022 01 4</b>	3	690	240	160
ASz(e) 648 a; DS(e) 648; ASzx 648; ASge 648; MSfv 649; MSh(e) 648; MShy 648 Z; MShy 649;	<b>3 39 01 021 01 1</b>	4	700	180	100
WSS 6.5-115; WSS 12-125; WSG 12-125; WSG 12-150; WSG 12-70 E; WPO 12-27 E; FSS 12-27 E; BLS 3.5; BLS 4.2; BLK 3.5; BLK 5.0;	<b>3 39 01 045 01 8</b>	5	390	240	140

## Carrying Case, plastic.



for types:

	Order References	Length approx. mm	Width approx. mm	Height approx. mm
ASy 630; ASye 636; ASke 636; ASkeu 636; DSke 636; DSkeu 636; ASse 636; SCU 7-9; DSse 642; SCS 4.8-25; SCS 6.3-19 T; SCT 5-40; SCT 5-40 U; SCT 5-40 M; SCT 6-25; ASsde 630; ASb 636; ASbe 642; MSh 635; MSh 636-1; UBS 1.6; UBS 2.0; BLS 1.6 X; BLS 2.5; RSs 636-2; BLK 1.6; RSs 636-4; RSs 638-5;	<b>3 39 01 065 00 7</b>	305	265	90

## Plugs.

FEIN precision is evident in even the smallest detail. The FEIN plugs are normed CEE collar plug systems for isolating transformers and three-phase current machines, and cannot be mistaken for normal plug systems.

The following plugs are available:  
1. CEE safety low-voltage plugs, two and three poled, 16, 32, and 36 A, for single-phase and three-phase safety transformers 42 V.

2. CEE collar plugs, three poled, 16 A, for three-phase isolating transformers 400 V.

	Pin Plug	Receptacle	Receptacle fixed to machine	Wall Receptacle
<b>CEE to single-phase protection transformers secondary 42 Volt, 50 Hz</b>				
DIN EN 60309, 42 V, 16 A, 12 h, 2 P	<b>3 07 28 127 00 6</b> 0,13 kg	<b>3 07 28 134 00 4</b> 0,15 kg	<b>3 07 28 145 00 7</b> 0,1 kg	<b>3 07 28 165 00 5</b> 0,2 kg
DIN EN 60309, 42 V, 32 A, 12 h, 2 P	<b>3 07 28 128 00 4</b> 0,22 kg	<b>3 07 28 135 00 8</b> 0,25 kg	<b>3 07 28 146 00 0</b> 0,19 kg	<b>3 07 28 166 00 8</b> 0,3 kg
42 V, 63 A, 12 h, 2 P	<b>3 07 28 199 00 1</b> 0,22 kg	<b>3 07 28 208 00 2</b> 0,25 kg	<b>3 07 28 202 00 1</b> 0,19 kg	<b>3 07 28 205 00 7</b> 0,3 kg
<b>CEE to three-phase protection transformers secondary 42 Volt, 50 Hz</b>				
DIN EN 60309, 42 V, 16 A, 12 h, 3 P	<b>3 07 28 162 00 9</b> 0,16 kg	<b>3 07 28 163 00 3</b> 0,18 kg	<b>3 07 28 164 00 1</b> 0,13 kg	<b>3 07 28 167 00 2</b> 0,22 kg
DIN EN 60309, 42 V, 32 A, 12 h, 3 P	<b>3 07 28 129 00 8</b> 0,25 kg	<b>3 07 28 136 00 1</b> 0,28 kg	<b>3 07 28 147 00 4</b> 0,2 kg	<b>3 07 28 168 00 0</b> 0,34 kg
42 V, 63 A, 12 h, 3 P	<b>3 07 28 200 00 9</b> 0,22 kg	<b>3 07 28 209 00 6</b> 0,25 kg	<b>3 07 28 203 00 5</b> 0,19 kg	<b>3 07 28 206 00 0</b> 0,34 kg
<b>CEE to three-phase isolating transformers secondary 400 Volt, 50 Hz</b>				
DIN EN 60309, 380 V, 16 A, 12 h, 3 P + (E)	<b>3 07 28 170 00 6</b> 0,18 kg	<b>3 07 28 171 00 5</b> 0,2 kg	<b>3 07 28 169 00 4</b> 0,15 kg	

# Protection and Isolating Transformers.

In accordance with DIN VDE 0100, power tools operated in certain areas must be operated by a low-voltage power supply or with safety isolators: for instance, when working in and on work-fitted tanks, on pipe systems made of conductive materials, or in other areas where movement is severely restricted or wet

grinders are used. FEIN transformers for single-phase and three-phase current are ideal for use in all these conditions. On their input sides FEIN safety transformers are connected to the primary mains supply, and produce a voltage of 42 volt at their output. Several class III power tools or other devices may be connected

up to one protection transformer at any one time, subject to the transformers' respective performance limits. FEIN isolating transformers supply the same primary-side and secondary-side voltage. Only one normal voltage device for normal voltage may be operated from each isolating transformer.

Please state Order No. and power rating in VA when ordering. Transformers are subject to a supplement for copper, depending on world notations.

## Single-phase protection transformers acc. to DIN VDE 0551

with CEE plug connections to DIN 49 465, in sheet steel housing, enclosure rating IP 44, portable, safety class II (double insulated), separate winding, fitted fuse for partial short circuit protection, partly also thermal switch.

**Primary: 230 Volt/50 Hz, secondary: 42 Volt**

Primary connection	Secondary plug connections	Length mm	Height mm	Width mm	Net weight kg	Output* VA	Part Number
2 m permanently connected, 2-flex rubber cable HO 7 RN-F 2 X 1 with plug acc. to DIN 49 441	1 CEE-add on socket 42 V, 16 A, 12 h, 2 P (3 07 28 145 00 7)	220	160	155	3,5	63	<b>9 23 01 222 04 9</b>
		270	185	200	5,0	160	<b>9 23 03 222 04 4</b>
	2 CEE-add on sockets 42 V, 16 A, 12 h, 2 P (3 07 28 145 00 7)	270	185	200	7,0	250	<b>9 23 05 222 04 2</b>
		355	240	175	12,0	400	<b>9 23 06 222 04 7</b>
		355	240	175	14,0	630	<b>9 23 09 222 04 6</b>

2 m permanently connected 2-flex rubber cable HO 7 RN-F 2 X 1,5 with plug acc. to DIN 49 441	2 CEE-add on sockets 42 V, 32 A, 12 h, 2 P (3 07 28 146 00 0)	355	240	175	18,0	800	<b>9 23 11 222 04 8</b>
		370	375	200	24,0	1000	<b>9 23 12 222 04 2</b>
	1 CEE-add on socket 42 V, 32 A, 12 h, 2 P (3 07 28 146 00 0)	370	460	200	30,0	1500	<b>9 23 13 222 04 3</b>
	and 1 CEE-socket 42 V, 63 A, 12 h, 2 P (3 07 28 202 00 1)	370	460	200	32,0	2000	<b>9 23 14 222 04 0</b>

## Three-phase protection transformers acc. to DIN VDE 0551

with CEE plug connections to DIN 49 465, in sheet metal housing, enclosure rating IP 44, portable, safety class II (double insulated), separate winding, fitted fuse for partial short circuit protection, motor protection switch.

**Primary: 400 Volt/50 Hz, secondary: 42 Volt**

2 m permanently connected rubber cable HO 7 RN-F 3 X 1 without plug	1 CEE-add on socket 42 V, 16 A, 12 h, 3 P (3 07 28 164 00 1)	285	295	195	14,5	200	<b>9 23 04 338 04 7</b>
2 m permanently connected rubber cable HO 7 RN-F 3 X 1,5 without plug	2 CEE-add on sockets 42 V, 16 A, 12 h, 3 P (3 07 28 164 00 1)	355	405	255	24,0	800	<b>9 23 11 338 04 4</b>
		355	405	255	24,5	1000	<b>9 23 12 338 04 8</b>
	1 CEE-add on socket 42 V, 32 A, 12 h, 3 P (3 07 28 147 00 4)	355	405	255	27,5	1500	<b>9 23 13 338 04 9</b>
		355	405	255	42,5	2000	<b>9 23 14 338 04 6</b>
	and 1 CEE-socket 42 V, 63 A, 12 h, 3 P (3 07 28 203 00 5)	455	455	255	46,5	3000	<b>9 23 16 338 04 2</b>

## Single-phase isolating transformers acc. to DIN VDE 0551

in sheet steel housing, enclosure rating IP 44, portable, safety class II (double insulated), separate winding, fitted fuse for partial short circuit protection.

**Primary: 230 Volt/50 Hz, secondary: 230 Volt**

2 m permanently connected rubber cable HO 7 RN-F 2 X 1,5 with plug acc. to DIN 49 441	Flange contour socket (Schuko) acc. to DIN 49 442 IP 44 with cover	355	240	175	14,0	630	<b>9 10 08 222 22 3</b>
		370	375	200	24,0	1000	<b>9 10 12 222 22 0</b>
		370	460	200	30,0	1500	<b>9 10 13 222 22 1</b>
		370	460	200	32,0	2000	<b>9 10 14 222 22 8</b>
		370	460	200	35,0	2500	<b>9 10 15 222 22 9</b>
		370	460	200	35,0	3000	<b>9 10 16 222 22 4</b>

## Three-phase isolating transformers acc. to DIN VDE 0551

with CEE plug connections acc. to DIN 49 465, in sheet steel housing, enclosure rating IP 44, portable, safety class II (double insulated), separate winding, fitted fuse for partial short circuit protection, motor protection switch.

**Primary: 400 Volt/50 Hz, secondary: 400 Volt**

2 m permanently connected rubber cable HO 7 RN-F 3 X 1,5 without plug	CEE-add on socket 16 A, 12 h, 3 P + (E) (3 07 28 169 00 4)	285	295	195	18,0	600	<b>9 24 08 338 38 5</b>
		355	405	255	27,0	1500	<b>9 24 13 338 38 3</b>

The appropriate plugs and coupling sockets are on page 240.

\* For the three-phase electric power tools the output of the transformer is rated by x 1,5, for the single phase electric power tools by x 1,2.

## ■ FEIN Build-on Motors.



FEIN build-on motors are reliable units, which are equally well suited for driving tools and pumps or for installations in all types of special machinery. Their power rating ranges from 180 to 2300 W. These motors are double insulated to EN 50144 and radio-suppressed to EN 55014.

FEIN build-on motors are available with reversible and electronic variable speed control. Also for high-frequency operation.

The drive shaft is fitted either with a toothed or keyed pinion.

FEIN also supplies special versions on request.



**FEIN Build-on Motors Series S 636, e.g. with 6-tooth pinion, long form.**

**FEIN Build-on Motors with electronic variable speed control Series Se 648, e.g. with 4-toothed pinion.**



## ■ FEIN Pipe Milling Machines.

In the field of pipe cutting technology, FEIN pipe milling machines enjoy worldwide renown. They are deployed to cut lengths of piping for laying, as well as to separate old pipes prior to removal. Whether cast iron or steel pipes for oil, gas and water supplies, such as those used for pipelines, public utilities, power stations and technical process equipment as well as tank construction.

### Two alternatives.

Differently configured specific electrical and pneumatic versions of the FEIN pipe milling equipment are available.

The added extra: the explosion-protected electric motors fulfil the same safety standards as the pneumatic motors.

### Clean Work.

The range of drives available make it possible to ensure that the cutting and feed speeds are maintained at the optimum level for the particular piping material being processed. This paves the way for the cost-effective use of HSS and HM tools. The two-chain system with separate spring tensioning and the adjustable tracking mean distortion-free and precise cuts can be achieved in steps of 250 to 3000 mm diameters.

For more detailed information, please ask for our brochure No. 1 88 1 649 00 3.



# ■ The history of the power tool begins with FEIN.

Ever since 1895 FEIN has always been one step ahead of all other manufacturers: it invented the world's first electrical power tool. However, FEIN's special innovative strength manifested itself even earlier. In the year 1867 at the age of only 25, Wilhelm Emil Fein and his brother Carl set up a "mechanical workshop" in Stuttgart: C. & E. FEIN.

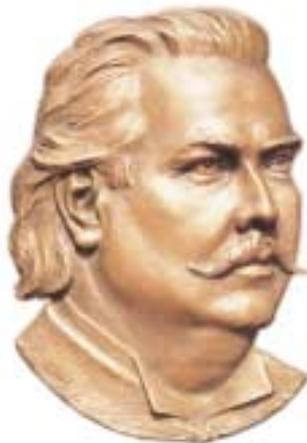
In 1873 he amazed the world of science by developing an electro-medical induction apparatus. Two years later Wilhelm Emil Fein invented the first electric fire alarm. Electric dynamos and a wide variety of lighting equipment followed. In 1885 he even constructed the first portable telephone.

## An invention that works.

It was in 1895 that Wilhelm Emil Fein built the first electric power tool: an electric hand drill. This pioneering invention resulted in tremendous savings in both industry and trade. The overwhelming success of this tool persuaded Emil Fein, the son of the founder, to specialise in the manufacture of power tools.

## A Company continues to develop.

The pioneering invention of 1895 was followed over the next few years by a large number of new developments: in 1897 the first power bench drill, in 1908 the first portable drill with flexible shaft, and at the turn of the century the first power drill with aluminium components for weight reduction and ease of handling. In 1901 FEIN produced the first hand drill with reduction gearing thereby making it possible to drill through hard metals.



Wilhelm Emil Fein



1890



1910



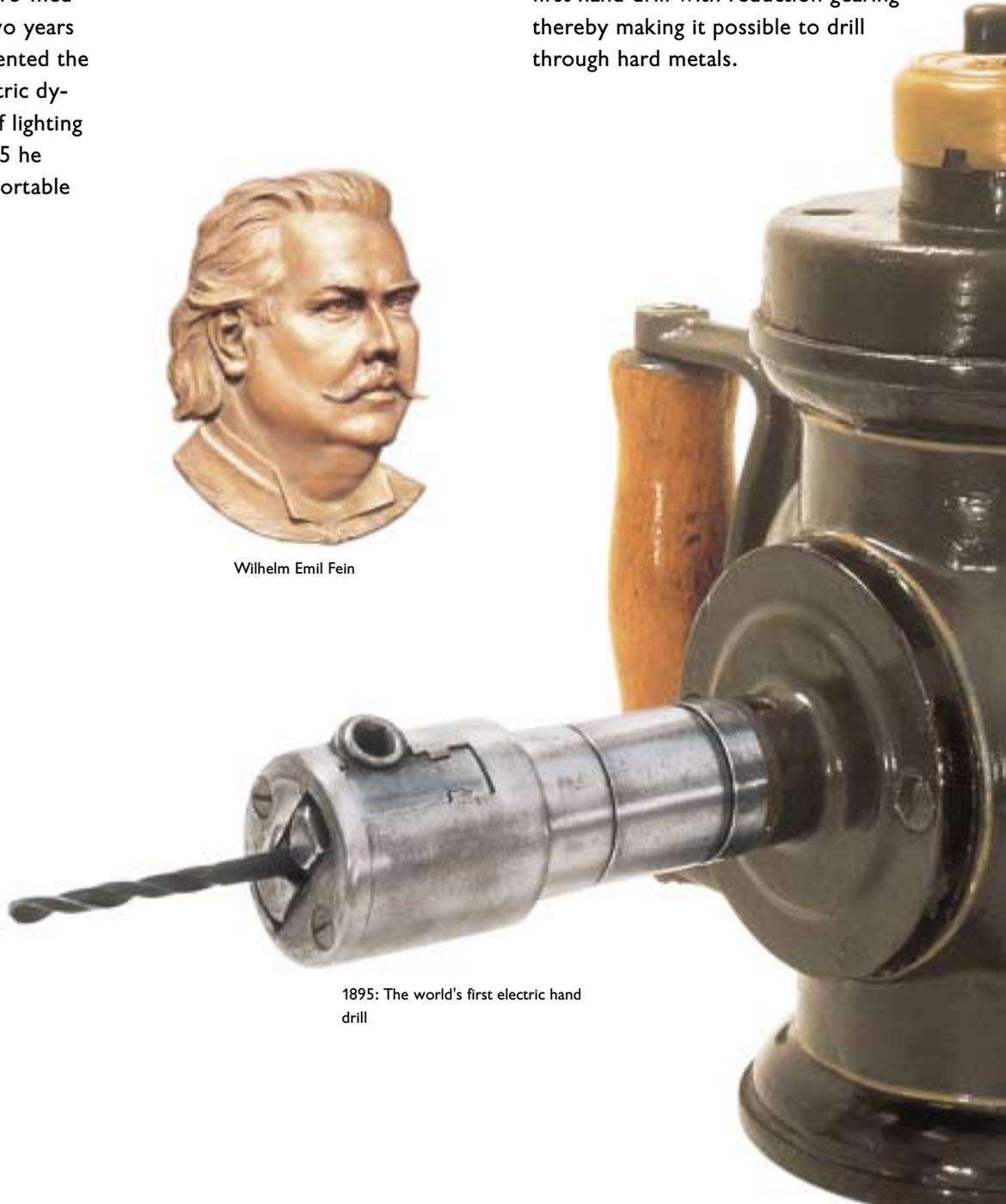
1932



1950



Today



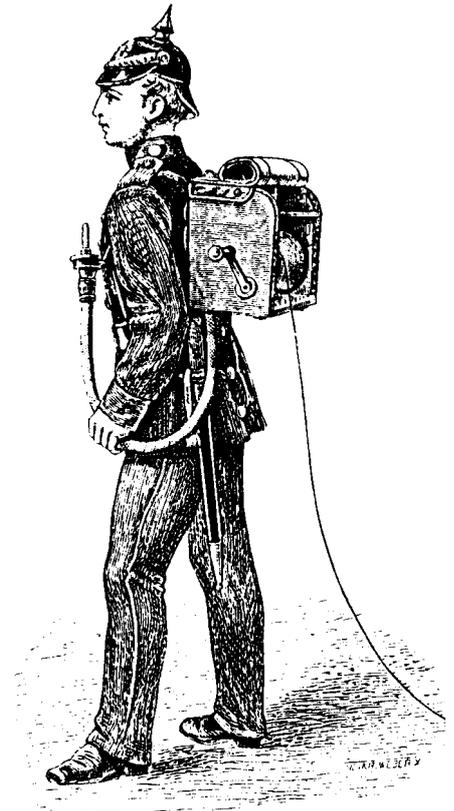
1895: The world's first electric hand drill

1903 saw the launch of the first FEIN power hand drill with three drilling speeds; in 1910 the first power hand drill with a slip clutch for overload protection and an automatic OFF switch. In 1912 to 1913 the first hand drill with a universal motor for direct and single-phase alternating current was developed.

1914 saw the first power-driven high-performance drill for direct and three-phase current. This period of the company's history saw countless other inventions and new developments which revolutionised working methods in many areas of trade and industry:

polishing motors, portable sanding motors, centring machines, cold rail saws, keyway milling machines, high pressure fans and electrically-driven block and tackle.

And that was just the beginning ...



1885: Portable telephone



1875: First electric fire-alarm equipment



1900: First electric hand drill containing aluminum components



1906: First hand sanding motor

# Innovative energy and quality: the basis of our success

## FEIN stands for progress.

In 1967 C. & E. FEIN became the first manufacturer in the world to introduce full-wave electronics on industrial drills. In the eighties FEIN developed high-speed oscillating power tools. On the basis of this technology the company built car body panel saws, windscreen removal tools and in 1986 the world exclusive FEIN SANDER: a completely new sanding machine with an oscillating, triangular sanding pad, 1986 also saw the systematic introduction of ergonomic principles in the form of FEIN kinetic handle. 1988 marked the launch of the FEIN ACCUTECH screwdrivers with programmable torque precision. The FEIN cutting system was presented in the year 1994, offering above all specialists in the automotive industry universal deployment possibilities. In 1995 FEIN presented the third generation of an extremely successful multitalent: the FEIN SANDER plus, with a uniquely varied system of accessories. As the FEIN MULTIMASTER it has been winning over entirely new groups of customers.

In 1997 FEIN launched the era of the HIGH-POWER MOTOR. This dynamic yet compact units produces significantly more power at any given speed than conventional motors, and has a high overload capacity while generating minimal heat.

In 1999 FEIN set a new standard in the field of works safety. The first angle grinder with EBS was launched. The electric brake system developed by FEIN stops the disc in less than 3 seconds.

The revolutionary FEIN QuickIN System is becoming more and more

popular. After the successful launch of the angle grinders the adaptation to keyless tool change followed for the "Metal Core Drill Units". In 2002 all of these core drill units have been equipped with this comfortable system.



FEIN Electric Brake System – the new safety standard for angle grinders.

## Quick IN

The unique FEIN rapid clamping system guarantees quick tool changes and ensures the disc is held totally securely.



Peak performance. The compact FEIN-HIGH POWER MOTOR sets standards in the field of universal motor construction.



2 battery positions for comfortable handling in every situation.



Perfect screwdriving, silent disengagement.



### FEIN state of art.

Fein's innovative and high value products are manufactured in the tree German towns of Stuttgart, Schwäbisch Gmünd/Bargau and Sonnenbühl-Genkingen. Research, development and production activities take place today at all three sites. The FEIN product program covers a wide variety of different tools and a comprehensive range of accessories. An extensive network of specialist stockists and FEIN authorised workshops ensure professional advice and

consultation and exemplary service is provided across many regions. FEIN foreign subsidiaries in Switzerland, Austria, France, Great Britain, Denmark, Hungary, Poland and the key overseas markets USA, Canada, South Africa and Australia as well as representation in many other countries provide FEIN customer services around the world. FEIN power tools have acquired a very special reputation across the globe among industry and trade professionals. The possibilities are limitless...



## ■ Worldwide success through innovation and quality.

How do you replace time-consuming manual labour by machine work? For more than 100 years, FEIN has always been looking for and finding better answers for this question. Innovative energy and the striving for quality are the ultimate foundations of Fein's success. What drives us on, however, is the constant endeavour to lighten the work of users in the widest possible range of sectors. By this means we have been able to develop tools which are carefully and precisely tailored to meet the particular requirements of the operator, and which enable work to be com-

pleted faster, safer, with greater comfort and a focus on the environment. Furthermore, FEIN is active in various technical commissions and select committees in Europe, giving it significant influence on the drawing up of standards and safety regulations, to the benefit of customers. Today, with its comprehensive program of power tools FEIN offers the optimum working equipment for a wide variety of applications.

### **Powerful and robust.**

Tremendous demands are placed on power tools used on a day-to-day professional basis. For this reason we are committed to ensuring that all our products perform utterly reliably, even under the toughest conditions - and do so year in, year out. This special quality requirement is reflected in our choice of materials. Materials and components are designed for maximum loads, with the aim of ensuring maximum operating safety, coupled with maximum useful life. The production process is sub-



ject to equally tough quality requirements. This involves FEIN building not only its own motors for its power tools, but also the housings, shafts, gear wheels, electronic components and handles. The winding connections in the electric motor commutators are welded under extreme continuous loads for outstanding thermal resistance. To protect the armature and field winding from the considerable heat, they are immersed and impregnated with special resins. The high-quality polyamide housings are rigid, shock and impact resistant, and prevent so-called leakage currents from developing.



### Safely reliable.

Aluminium motor housings are used on tools, which develop very high torque, with integral double insulation in accordance with international safety standards. All FEIN power tools naturally meet safety standards to EN 50144. Another outstanding feature is their straightforward design, which makes them easy to service, to dismantle and to reassemble. To ensure that nothing is left to chance at the assembly stage, each individual component and each machine is tested for operating safety and overload resistance. Every FEIN power tool has to prove itself in continuous operation before it is allowed to leave the production line. These are merely a few examples of the importance attached to quality as a design and production principle. They are part of a comprehensive quality management system,, which covers all parts of the company, which since 1995 has also been certified in accordance with DIN ISO 9001. For you, this is yet another confirmation that you will work better “Powered by Innovation”.



# FEIN Glossary.

## A

**Ampère** (abbreviated A). Unit of measurement of electrical current flow.  
(– Units of measurement) Formula symbol: I

**Austenitic sheet steels.** Steel with chromium contents of up to 30 % and nickel of up to 20% and a solid solution of iron and carbon (austenite).  
Characteristics: good deforming properties, resistant to corrosion, tough.

## B

**Balancer.** Suspension device for tools. Features an adjustable automatic height adjustment, as compared to spring hangers where the weight of the suspended item determines its extension length.

**Balancing arbor.** Tapered device for static and dynamic balancing. For example, for grinding wheels.

**BIA.** Berufsgenossenschaftliches Institut für Arbeitssicherheit (German Professional Association Institute for Industrial Safety). Testing office of the German Professional Associations.

**Bit.** Used in drilling and screwing process, e.g. drill bit, screwdriver bit.

**Brake.** Device for slowing down a tool shaft speed abruptly and bringing it to a halt. For example: the electromechanical rapid braking when the FEIN Safety Angle Grinder WSB 25-108/WSB 25-230 is switched off.

**Bushhammering.** Surface roughing in stone working, e.g. with hammer drills.

## C

**Cable (power lead).** Electric, insulated multistrand cable for electric power tool input.

Safety class I electric power tools:  
3-strand for 1-phase tools  
4-strand for 3-phase tools  
(1 green/yellow strand for ground conductor)

Safety class II + III electric power tools:  
2-strand for 1-phase tools  
3-strand for 3-phase tools  
(only safety class II)

Insulation quality:  
**V** = PVC  
**R** = rubber  
**N** = polyneoprene

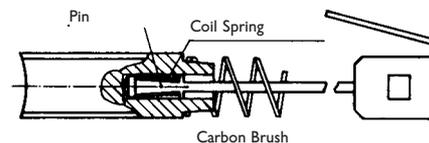
Diameter: 0.75-6 mm<sup>2</sup>  
Copper conductor: fine wire (F)  
G = 1 strand is green/yellow  
X = without ground conductor

Example designations:

- H 05 RN-F 2X 1: fine-wire lightweight rubber sheathed cable, cable cross section 1 mm<sup>2</sup>
- H 05 VV-F 3G 1.5: fine-wire medium plastic sheathed cable, cable cross section 1.5 mm<sup>2</sup>
- H 05 RR-F 2X 0.75: fine-wire lightweight rubber sheathed cable,

H 07 RN-F 4G 2.5: cable cross section 0.75 mm<sup>2</sup>  
fine-wire medium rubber sheathed cable, (interior strands rubber, outer jacket insulated with polyneoprene)  
cable cross section 2.5mm<sup>2</sup>

**Carbon Brush.** Conductor for transmitting current to rotating components such as commutators or sliprings in motors and generators. It consists of natural or Acheson graphite with special additives (copper powder) and in some cases it is impregnated as required for conductivity. Contact with commutator is through spring pressure.  
Carbon Brushes with automatic switchoff are fitted with a plastic pin inside the brush which is pretensioned by a coil spring. Once the brushes have worn down to a point the plastic pin makes contact with the commutator and lifts away the remaining brush thus interrupting current flow and stopping the machine.



**CE.** Products marked with this symbol must comply with the standards laid down in European Directives. The corresponding Directives (e.g. LVD - Low Voltage Directive) are listed in the supplied operating instruction leaflets.

**CEE.** International Commission on Rules for the Approval of Electrical Equipment. This commission compiles text specifications for the approval of electrical equipment by national testing bodies.

**CENELEC.** Comité Européen de Normalisation Electrotechnique (European Committee for Electrical Equipment Standards).

**Chucks, drill.** Clamping device for mounting and securing tooling on drills, e.g. spiral bits. There are quick-action chucks, jaw chucks, etc.

**Circumference speed.** Speed of a rotating body at a specific outer diameter. Example: calculating the circumference speed of a grinding disk with D = 230 mm, idling speed of the grinder n = 6500/min. Maximum permitted circumference speed for fiber-bonded roughing-down and cutting disks - 80 m/s.

**Clutch.** Disconnecting system for tool or drive shaft.  
(→ positive clutch)  
(→ double clutch)  
(→ kickout clutch)  
(→ slip clutch)

**Compressed air.** Generated by compressors for driving pneumatic equipment and systems.

**Commutator.** Current collector made of copper lamina with intermediate insulators for universal current motors.

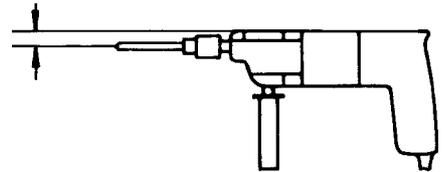
**Cone.** (→ Taper)

**Consumption** (abbreviated W or kW). (Nominal consumption, consumption performance). Product of voltage, current and performance factor cos p in the case of alternating current.

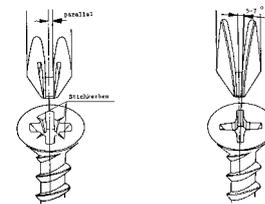
Formula symbol: P1  
Universal motor: cos p = 0.95  
Three phase current: cos p = 0.85

**Controls.** External torque setting on impact wrenches. For example ASb 648-EC2.

**Corner clearance.** The distance between a tool drive shaft and the top edge of a power tool. For example on drills.



**Cross recessed head.** Geometric shape on the head of screws designed to accept the screwdriving tool. DIN 7962 distinguishes between:  
Phillips (PH) form H  
Pozidriv (PZH) form Z



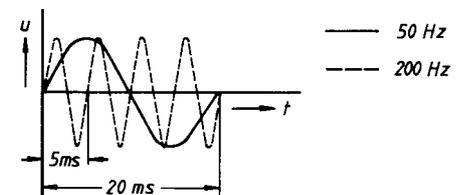
Pozidriv form Z      Cross recess form H

**Current types.** (→ Direct current; Threephase current; Motor types)  
Direct current from batteries, generators or rectifier circuits. Voltage wave does not change polarity.  
Symbol: —

Three phase alternating current. (→ Rotary current)  
– sinus-form current with shifting cycle, frequency-dependent, three phase.

Symbol: ~ 3  
Single phase alternating current. Like three phase current, but only single phase.  
Symbol: ~

1 Hertz (Hz) = 1 Sine wave cycle per second  
50 Hertz = 50 cycles per second  
60 Hertz = 60 cycles per second  
300 Hertz = 300 cycles per second



**Cutting Speed.** Advance /feed) speed when cutting workpieces (sawing, shearing, nibbling). Unit of measure: m /min.

**Cutting speed.** The speed of a rotating body with respect to a specific diameter or as a mean stroke rate in the case of stroke movements. Unit of measure: m/min.

**Cutting wheels.** (→ Roughing-down disk)  
Vmax = 80 m/s

## D

**Dead man switch.** For some countries we supply electric power tools with dead man switches (returns automatically to "Off" when released) in accordance with national regulations.

**Decibels.** Abbreviated dB. Unit of measure for the relationship between two performances, voltages or currents, is used e.g. to state noise levels (→ Noise level).

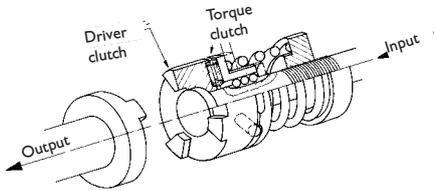
**Depth Stop.** Device for limiting the depth of penetration when drilling, tapping or screwdriving. Consists of a stop sleeve and cap sleeve. Cap sleeve: for mounting on scwdriver, Stop sleeve: for limiting depth.

**Die.** Fixed part on a stamping machine (nibblers).

**DIN.** Deutsches Institut für Normung (German Standards Institute), formerly known as the Deutsche Industrienorm - German Industrial Standard, is a voluntary work group which compiles standards and specifications which are published as standards sheets.

**Direct current.** Electrical current which constantly flows in the same direction, unlike alternating current. Symbol:  $\text{---}$

**Direction of rotation.** Direction in which a rotating body turns. Standardized interpretation for motors: when driveshaft is observed face on. Fein interpretation for power tool motors: when commutator



is observed, or direction of drilling action.

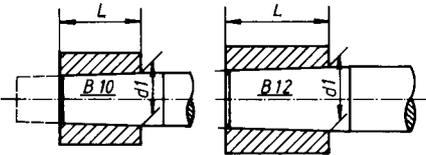
**Double clutch.** Adjustable clutch for repetitive screwdriving applications in metal and plastics. Consists of a driving clutch or coupling and a torque clutch. (→ Clutch)

- Power transmission and clutch release is dependent on torque clutch pretension.
- Clutch action can not be influenced by operator pressure.
- Effective without depth stop – always supplied without depth stop.

**Double insulation.** Separate insulation in addition to the functional insulation. Double insulation = functional insulation + safety insulation.

Symbol: (→ safety classes)

**Drill chuck taper.** Drill chuck mounting section on the drill shaft according to DIN 238 for B 10 and B 12.



Heap-sampling and adjustment angle of tapers to DIN 238 from B 10 to B 24 correspond to Morse tapers according to DIN 228.

	Heap sampling according to DIN 228/238	d <sub>1</sub>	L
Taper B 12	1 : 20.047	12.065	18.5
Taper B 10	1 : 20.047	10.094	14.5
Adjustment angle	1° 25' 43"		

The advantage of this type of mounting: highly concentric running through precise centering.

**DSA.** Deutsche Schleifscheiben-Ausschuß (German Grinding Disk Committee).

**Duroplaste.** (→ Thermoplaste).

**Dust extraction.** Collection of dry material removed, e.g. when treating surfaces, using internal dust

trap (dust bag on oscillating grinder) or external dust extraction dry (dust extractor varies from country to country).

**Dust extractor.** For collecting dust and chips by suction and disposing of them without causing pollution.

## E

**Electric power tools.** Tools driven by an electric motor or electromagnet. For use indoors or outdoors for mechanical tasks, designed in such a way that the motor and tool form one unit which is portable and which is hand operated when in use or mounted in a support device (as per EN 60144, EN 61029).

**Electro-pneumatic.** Transformation of electrical energy into mechanical impact energy via an air cylinder and piston system, as on rotary hammers.

**Electronics.** Aspect of electrical engineering which deals with the development and application of electronic components such as semiconductors and circuits (→Feedback speed controls, Speed control electronics.)

**Engaging clutch.** Clutch section which can be engaged while the screwdriver motor is running; makes gentle contact to connect drive with tool shaft.

**Enlargement tapers.** (→ Morse tapers).

**Ergonomics.** The science of adapting work to humans. The study of workplace and equipment design (gripping surfaces, kinetic grips, integral switches).

## F

**Feedback speed controls.** Electronic speed regulator. Motor speed is automatically influenced (feedback effect). Speed is regulated by an electronic element in relation to load, but not by hand. The electronic speed regulator can in addition be fitted with a preselection option for various speeds (with speed settings or continuously variable).

**FI-safety switch.** Safety device preventing excessive contact voltage. Switch-off criterion < 30 mA in < 0.1 s.

**Fiberglass reinforced plastic (FRP).** Exhibits high mechanical strength.

**Flange.** Element for connecting parts together (grinding wheel to grinding shaft etc.).

**Frequency (Hz).** The rate at which alternating current changes its direction of flow.  
1 Hz = 1 cycle  
50 Hz = 50 cycles

## G

**Gearing.** For transmitting or modifying movements in order to alter the mechanical speed or direction of rotation, and to alter the output shaft position, e.g. angle gear operating speed and torque shift are in inverted proportion at same motor performance i.e. low operating speed - high torque, and vice versa.

**Goods No.** Code from the export trade statistics goods list, e.g. Power tools (general) 8508...  
Angle grinder 850880510

**Grain.** (→ Sanding sheets)

**Grinding wheel.** Tool for cutting processes in surface treatment and for cutting off work. Various geometrical, rotation-symmetrical shapes – disks, cones, truncated cones, spheres – made of natural or synthetic grinding media, bonded ceramically or with artificial resin, sometimes with reinforcing layers.

**GS symbol.** Test symbol. Equipment has been tested in accordance with the German Equipment Safety Law, including Appendices A, B and C.

## H

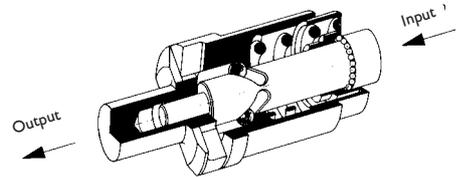
**High frequency power tools.** Driven by induction motors and fed with frequency converters with increased supply frequency.

- Advantages:
- higher output through higher operating speed without increasing weight/tool size
  - constant operating speed, increased productivity
  - induction motor, no carbon brushes and no collector
  - long operating life
  - low energy costs

**High frequency.** In general: the frequency of electric oscillation and current in the range 10 kHz - 300 GHz. In the case of electric power tools with induction motors: increased supply frequency 200 or 300 Hz, in special cases up to approx. 600 Hz (→ Current types).

**HP.** Abbreviation for horse power as a performance unit. However, replaced today by Watt or kilowatt.  
1 kW = 1.36 HP = 1.341 hp  
1 HP = 0.74 kW

## I



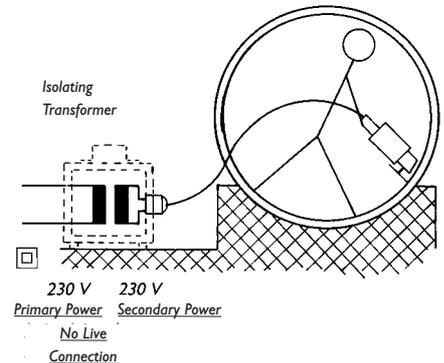
**Impact wrench movement.** Spring mass system for generating periodic impacts.

**Inch,** imperial unit of measurement  
1 inch = 1" = 25,4 mm  
5/8" = 15,87 mm  
" = 12,7 mm  
" = 6,35 mm

**Industry statistics.** Reference number for production statistics issued by the German Statistical Office.

**Integral switch.** Integrated switch. On/Off switch on FEIN power tools with an ergonomic shape. Easy to trigger from various grip positions.

**Isolating transformer.** Galvanic transformer with separate windings. Tool metallicly separated from the supply ground.

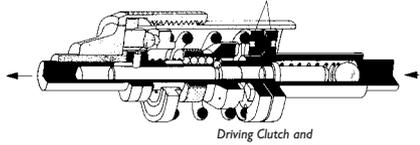


## J

**Joule (J).** Unit of calorific energy (formerly calorie)  
1 Joule = 1 Watt second (Ws) = 0.239 calories.

**K**

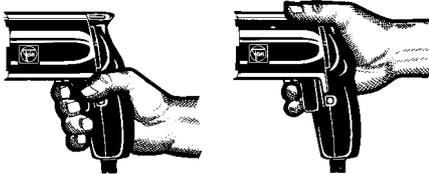
**Kickout clutch.** Found on FEIN screwdrivers. Precise tightening torque can be preselected for use in production on metals and plastics. (- clutch)



- Power transmission and clutch release is dependent on torque clutch pre-tension,
- Clutch disengages without ratcheting,
- Clutch action can not be influenced by operator pressure.

**Kilowatt (KW).** Electric power unit: 1 KW = 1,000 Watts

**Kinetic grip.** Handle on FEIN power tools with pistol grip. Ergonomically (' Ergonomics) optimized for both grip positions.



Power grip

Inline grip

**kVA.** Unit of apparent electric output, e.g. transformer nominal performance  
1 kilovoltampère (kVA) = 1000 voltampères

**L**

**LED display.** Light emitting diode display.

**Load speed.** Abbreviated: n. Speed in any load condition, as opposed to no-load speed.

- For power tools:
- Normal load speed (as defined by normal load condition) or
  - load speed at rated input (→ no-load speed)

**M**

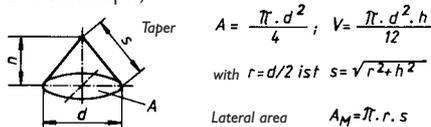
**Maintenance unit.** Device for processing compressed air. (→ Compressed air).

**Maintenance.** Monitoring and checking equipment. With respect to portable electrical equipment, see VBG 4, specifically for electric power tools also DIN VDE 0701 Part 1 and 260.

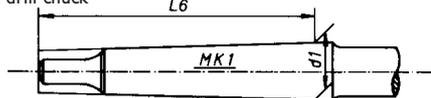
**Maschine weight** (→ Weight)

**Morse cone = morse taper.** (→ taper)

**Morse taper.** Geometrical rotating element. (→ Drill chuck taper)



e.g. morse taper MK1 as per DIN 228 for mounting drill chuck



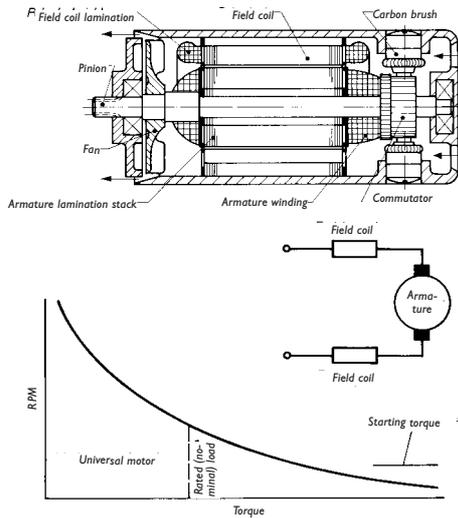
	Heap sampling according to DIN 228/238	d <sub>1</sub>	L6
Morse taper MK 1	1 : 20.047	12.065	62

Reducing sleeve: MT # 3 to MT # 2.  
Enlargement taper: MT # 2 to M # 3.

**Motor characteristics.** (→ Motor types)

**Motor protection switch.** Device for protecting motors from damage due to heavy overloading. For example, thermally activated switch.

**Motor types.** **Universal motor** = commutator series-wound motor (armature and field coils are in series). Can be operated on alternating or direct current. Speed of motor drops under load. High starting torque. Rotation is changed by reversing field polarity on the field coils.



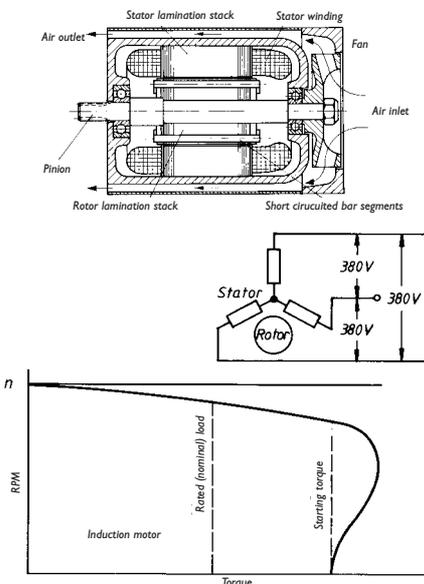
**Induction motor.** For example three phase squirrel cage motor. Three windings offset geometrically by 120 degrees in the stator. The rotor consists of short circuited bar stack. (Squirrel cage rotor). The operating speed is not dependent upon load over a wide range however, speed can be affected by the number of pole pairs present and the operating frequency. Rotation is changed by reversing two of the three phases. Low starting torque. (→ High frequency power tools.)

$$RPM = \frac{f \cdot 60}{P}$$

f = Mains frequency (Hz, Cycles)  
p = Number of pole pairs  
60 = 60 seconds/minute

For example: a 2 pole (one pole pair) 300 Hz. High frequency motor has an operating speed of

$$n_s = \frac{300 \text{ Hz} \cdot 60}{2} = 18,000 \text{ RPM}$$



**NK.** Normal corundum = aluminium oxide (A1203); standard abbreviation: A (→ abrasive paper).

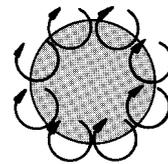
**No load speed.** Abbreviated: N. Operating speed when no external load is applied. (→ Full load speed)

**Noise level.** Noise emissions level as per EN 23744 Section 21 when idling (emission) in dB (decibels). Criteria in accordance with UVV (workplace evaluation).  
> 85 dB (A) Ear protection must be supplied.  
> 90 dB (A) Ear protection must be worn.

**O**

**Operating speed.** Revolutions per time unit, e.g. per minute(RPM), per second (RPS). No load symbol: no. Full load: n (→ gearing).

**Orbital sanding.** Surface processing with orbital sander. Sanding plate is mounted on an eccentric output shaft. This arrangement does not produce a rotary sanding action.



**Order reference.** Abbreviated 6-figure identification number for ordering a product or part, e.g. 7 220 49. However, the voltage and type of current must also be stated.

**Oscillating movement.** Radial or linear to and fro movement generated by an eccentric cam. (→ Stroke)

**Output.** In Watts (W) or Kilowatts (kW). The mechanical output of a motor, proportional to the product of torque and rpm. Formula symbol: P2

**Overcurrent limiter.** (→ Fuse)

**Overload protection.** Thermal overload switch

**P**

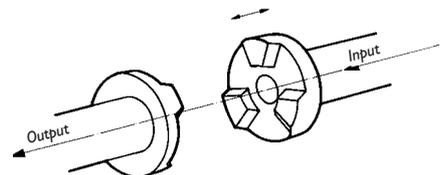
**Phillips head screws.** (PH); (→ cross recessed head)

**Plug connection.** Device for connecting portable electric equipment with flexible cable and plug to a permanent mains power socket outlet.

**Pneumatics.** Term designating technical procedures employed with the purpose of utilizing compressed air for the transmission of forces.

**Polyamide.** Expansive thermoplastic exhibiting high tensile strength. Holds tolerances well when molded, resistant to heat and aging. Has very good electrical insulating properties. Is often reinforced with fiberglass. Used on all FEIN motor housings and side handles. Surface hardness is similar to aluminum. Trade name: Ultramid.

**Positive clutch.** Can be adjusted for individual and continuous operations in woodworking or metal working (→ Clutch).



- Power transmission influenced by clutch setting and by operator pressure.
- Clutch can thus be used either in conjunction with or without a depth stop. Easy checking.

**Power factor cos (Phi).** Phase angle between current and voltage, caused by the inductive load of the motor (→ Input)

**Power-to-weight ratio.** A measure of how much power P2 (W) (corresponding to the nominal consumption P1 (W)) the tool delivers relative to its weight.  
Unit: P2(W/kg)/G

**Pozidrive.** (→ cross recessed head)

**Profile.** Cross section of a body. For example; pipe, angle iron, I-beams, bars and trapezoidal or corrugated sheet metal.

**Property classes.** Classes defining screwed connections by means of a value, e.g. 5.8.. The first number 5 is 1/100 of the minimum tensile strength = 5 x 100 = 500 N/mm<sup>2</sup>. The second number 8 is the ratio of the minimum yield point = 1/10 of the value = 5 x 100 = 500 N/mm<sup>2</sup>.

**Punch.** Moving part of the punching tool. (Nibbler blade) (→ Die)

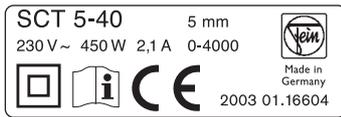
## R

**R/L.** (right /left, i.e. clockwise/counterclockwise). Symbol for electrical changeover of power tool's direction of rotation.

**Radio interference suppression.** Means of suppressing electromagnetic waves in electrical equipment to prevent interference with radio and television reception.

**Rated input (W).** Power input at the rated voltage stamped on the manufacturer's name plate.

**Rating plate.** Plate attached to the power tool indicating type, technical data and serial number.



**Reducing sleeve.** Intermediate device which allows small Morse taper bits to be run from a larger Morse taper receiver, e.g. MK 2-MK 1 (→ taper, cone)

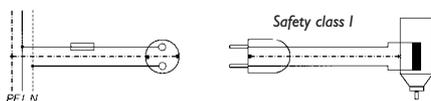
**Restart lock.** Automatic equipment switch-off, prevents tools restarting after power loss.

**Rotary sanding.** Sanding pattern created by a rotating sanding pad. (→ Orbital sanding)

**Roughing-down disk.** Cold-pressed, fabric-reinforced, plastic-bonded grinding disk for rough grinding tasks, used specifically on angle grinders. Vmax = 80 m/s.

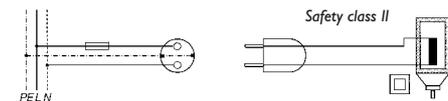
### Safety classes.

**Safety class 1:**  
Power tools with a grounding conductor.

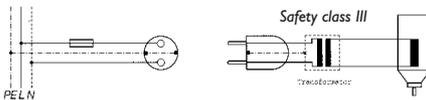


**Safety class 2:**  
Power tools with double insulation. (Insulation jacket, additional insulation) IEC-Standard.

Symbol:



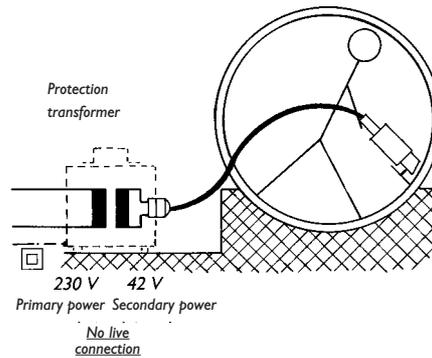
**Safety class 3:**  
Power tools for low-voltage safety current 42 V transformer.



**Safety clutch.** (→ slip clutch)

**Safety device.** Mechanical or electrical switch-off device (e.g. shear pin, fuse, overload protection)

**Safety low voltage.** (° Safety classes). Low voltage generated by a safety transformer for working in restricted spaces and risk areas, e.g. boilers, mains voltage 42 V, idling \* 50 V.



**Safety rules.** Regulations (standards, VDE specifications, Labor Authority requirements) in which the mechanical and electrical safety precautions for machinery and plant are specified for the operator's safety, e.g. the mechanical safety features required for circular saws and angle grinders.

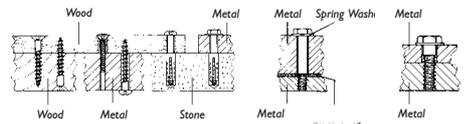
**Safety switch.** Electrical or mechanical switch-off device designed to protect operators of machines and equipment.

**Sanding belt.** Continuous sanding belt on fabric backing. For belt sanders. Principle: (→ Sandpaper)

**Sandpaper.** Strong paper or fabric with a layer of coarse or fine abrasive with a lightweight, medium or heavy bonding for sanding surfaces. Classified according to abrasive grade and backing quality. Attached to a sanding plate by clamping, adhesive or Velcro.

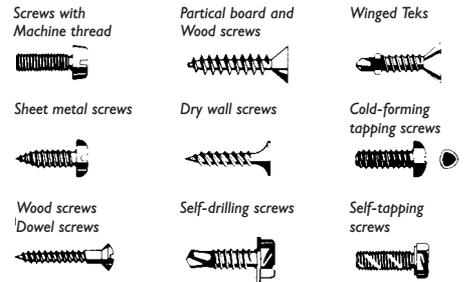
**SC.** Silicon carbide (SiC), standard abbreviation: C (→ Sandpaper, abrasive wheels).

**Screwdriving applications.** Characteristic of a fastened assembly. Depending on the pieces being fastened together. (Soft-Elastic-Hard)



a) Soft base application    b) Elastic base application    c) Hard base application

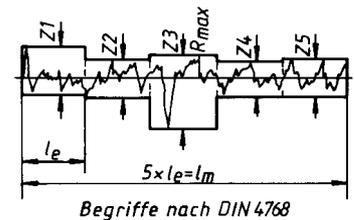
**Screws.** Cylindrical fasteners with an exterior thread and a driving head to interface with tools. For detachable connections between workpieces without damaging a component. (→ Cross recessed head).



**Separation transformer.** Transformer with separate windings, built in accordance with → safety class II, secondary socket without safety lead connection (→ safety cut-off)

**Slackening torque.** (ft./lb.) The torque required to release a screw connection.

**Slip clutch.** A mechanical device providing a friction coupling between two rotating mechanical elements. E.g. as overload protection for hammer drills. (→ Clutch).



**Slow start.** Electric current limiter switch to reduce high peak current draw when starting. Fitted to high-power units, e.g. angle grinders, in order to reduce mains fuse burnout. The tool speeds up slowly.

**Speed control electronics.** Speed control where the motor speed is preselected or changed manually by pressing or turning electronic elements.

**Spiral cord set.** Flexible, coiled cable.

**Spring balancer.** (→ Balancers)

**Statistic goods No.** (→ goods no.)

**Stop sleeve** (→ depth stop)

**Stroke.** Back and forth movement in a straight line (from minimum to maximum point), e.g. jigsaws, oscillating tools. FEIN "Triangle Sander" PLUS.

**Surface roughness.** Surface quality measured in μm.  
Rmax = maximum value measured from the deepest to the highest measuring point of the whole measured section (peak-to-valley height).  
Rz = average surface roughness expressed as the arithmetic mean of the individual surface roughness values of 5 adjoining measured sections.

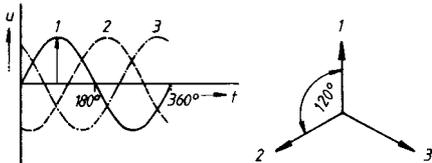
**T**

**Taper bore.** Conical bore in the bore shaft to receive the machine tool (→ Morse taper).

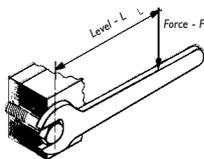
**Thermoplastics.** Plastics which can be reshaped when heated. Thermoset plastics on the other hand, are rigid plastics with a permanent shape.

**Threaded inserts.** For example screwed inserts, threaded bushes, which are screwed into soft and porous materials in the case of screwed connections with metric screws.

**Three-phase alternating current.** Each phase is offset by 120 degrees. Constant rpm.



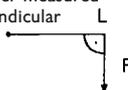
**Tightening torque (Nm).** Torque  $M$  (= force  $F$  - lever  $L$ ) with which a screw is tightened.



**Tool mounting.** Feature of an output shaft. For mounting tooling, i.e. Grinding wheels, hammer bits, nibbler punches, screwdriver bits, drill chucks.

**Tool weight.** (→ Weight)

**Torque.** A product arising out of a lever measured from a point of rotation and the perpendicular force applied to this lever:  $M = L \times F$   
→ Tightening torque.



**Torsion bar.** Serves to limit the torque to the preset value, e.g. in accu-drive screwdrivers 1 and 3.

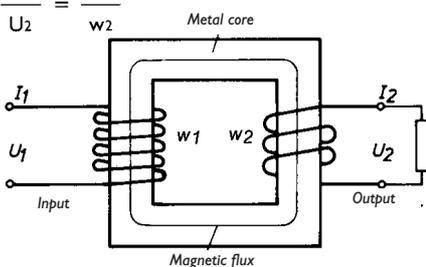
**Torsional forces.** Twisting load on a material. The effect of rotating forces.

**Torx.** Special screw head shapes of internal and external drives for high torque transmission. Drive recess is not damaged by over-tightening.



**Transformer.** Electromagnetic energy convertor for transforming alternating voltage into a high or lower voltage of the same frequency. The transformer consists of an enclosed, laminated metal core with two separate windings. The relationship between input and output voltages corresponds to the number of windings on the coils. Output rating: (→ KVA, Safety voltage, Isolating transformers, Protection transformers).

$$\frac{U_1}{U_2} = \frac{w_1}{w_2}$$



**TÜV - Technischer Überwachungs-Verein** (German Technical Control Association), with test offices able to issue the → GS symbol.

**Type.** Alphanumeric designation of FEIN power tools. For example: MSfa 680 d.

**U**

**Universal motor.** A motor which can be operated on either AC or DC. (- Motor Types)

**V**

**V 2 A.** Abbreviated name of a type of rust-free steel.

**VDE-Symbol.**



Test symbol of the VDE testing lab in Offenbach, Germany. Issued for test symbol compatible products. VDE = Verband Deutscher Elektrotechniker (Association of German Electrical Engineers).

**Velcro.** A Velcro fastener consists of two interacting parts:

Active element:  
Fastening element: Hook or Mushroom



Passive element:  
Woven or knit fastening element with innumerable fine loops



Fastening principle: Both elements are pressed together. The fastening elements engage in the loops and are secured.

**Voltage.** Volt. Abbreviation V. Formula symbol U

**Volt.** (Abbreviation V). Unit of electrical potential or pressure. Formula symbol: U.

**Watt.** (Abbreviation W). Unit of electrical consumption and the delivered power in Watts (W) or kilowatts (kW) respectively.

**Weight** of the electric power tool as per DIN VDE 0740 Section 1000; the machine weight denotes the mass of the electric power tool without detachable chuck, without detachable safety features, without auxiliary handle and without power supply cable. In the case of electric power tools, the machine weight is usually stated.

The operational weight is the mass of the operational electric power tool with detachable chuck, with detachable safety features and - insofar as necessary - with auxiliary handle, but without the weight of the power supply cable. If the chuck, the machine tool or the safety features are detachable, then these must be taken into consideration accordingly when calculating the operational weight.



## ■ Quality of advice from approved FEIN stockists.

To ensure that you always choose the correct tool for your particular application from the wide range of FEIN power tools, FEIN sells its products only through expert stockists: well-qualified specialists who are not merely there to sell, but who act as "consultants for industry and trade". The sales network consists of selected FEIN depots in the hardware, tool and machine trade, specialist stockists as well as authorised FEIN workshops. All these agencies guarantee a quality of advice, which reflects the wide range, and high standard of the FEIN program. Your FEIN stockist is naturally also able to provide extra information on special FEIN products. Ask FEIN to send you a list of the stockists in your region. If desired, you can also call upon the services of a FEIN consultant, who in conjunction with your stockist will recommend tailor-made solutions. Your local authorised FEIN

stockist as well as our central repair workshop are always available to carry out maintenance and repair work on your behalf.

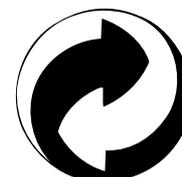


## ■ The “grüne Punkt” and FEIN.

High-quality products need to be packaged to ensure that they can be safely stored or dispatched. FEIN protects its electric power tools in packaging which satisfies these requirements. Fein's philosophy in this respect can be summed up as: "as much packaging as necessary, yet as little as possible". In addition, we at FEIN believe that packaging that is no longer needed is not necessarily

the same as waste which is destined to harm the environment. The packaging materials used for FEIN power tools have been selected to ensure that they can be 100% reused. By this means FEIN is making an active contribution to protecting the Earth's natural resources. The German "grüner Punkt" system indicates products whose full recycling capabilities have been assured.

This symbol can be found on all FEIN packaging - for power tools and accessories alike



The green point is an initiative launched by the recycling company Duales System Deutschland GmbH.



## ■ Guaranteed FEIN.

All the power tools made by FEIN are carefully inspected, tested and subjected to the stringent FEIN quality control system.

Over and above the statutory warranty obligation,

we also offer a guaranty in line with the FEIN manufacturer statement. For more details please contact your FEIN dealer, agent, or customer services at FEIN.

Any damage resulting from inexpert handling, over-

load or wear due to use is generally excluded.

## ■ FEIN power tools and recycling.

An essential feature of FEIN power tools is their proven quality and long useful life. By the time tools need replacing they tend to have clocked up many years of service. And when the time eventually arrives, FEIN offers an environmentally friendly service: You may return old tools and used batteries to

him. These items will then be dismantled at a special recycling centre, the individual materials will be sorted out and recycled responsibly. The material labels play an important role in this process. Paint-coated copper wiring, oil, grease or plastic-coated steel parts remain problematic. Aluminium and

steel parts, by contrast, are easy to recycle; our power tools consist largely of these two materials. We are able to achieve a recycling rate of almost 75%. Don't throw your old tools and batteries into the normal domestic waste. Instead, help to conserve scarce resources and costly energy, and at the same

time help protect our environment. One of the key preconditions for recycling to be a success is the responsible and committed involvement of consumers, commerce and manufacturers. Recycling needs everyone to be involved.

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