

Operating Instructions
Rail- Drilling Machine
SBM-V, SBM-E/48V and SBM-E/230V



ERICO

offers the technology for a universally applicable rails drilling technique for

- **Carrying out drilling for railways and rail tracks**
- **for the ERICO-rails-contact systems SK and DSK**
- **for the areas of guidance and safety technology and**
- **for other sectors in the railway building industry**

ERICO rail drilling technology distinguishes itself because of the following characteristics:

- Light, easy to handle and compact drilling machines with a choice of the following drive motors
- Two-stroke petrol engine with a spindle speed of 267 r.p.m. for the \varnothing -range up to 24 mm and a slow drill with a spindle speed of 212 r.p.m. for drill holes with a $\varnothing \geq 24$.
- Direct-current disc drive engine of 48 volt DC 0,62 kW, battery powered with a spindle speed of 391 r.p.m.
- Alternating current motor of 230V/AC, 1,5 kW with a spindle speed of 220 or 280 r.p.m.
- Short drilling times because of spindle speeds adapted to each drill diameter.
- Compact storage of the drilling tools in transportable metal cases.
- Simple, safe and fast installation of the machine on the rails with quick loosening devices BSK1 and BSK2
- Drilling unit can remain fixed to the rail by means of rail foot clamping unit BSF while rail traffic is being maintained.
- Easily changeable rail profile templates for all rail track profiles.
- Special templates for special uses, e.g. hinged profiles for grooved rails.
- Use of universal templates for several rail profiles, e.g. for Germany S49 – S 54 – UIC 60
- Drilling holes at exact intervals with drilling gauges and special templates for axle counters, Fishplates and insulated rail joints.
- Encompassing drilling program for all applications in the rail sector with the internationally accepted standard tool holding fixture “Weldon 19”
- Extensive range of accessories
- Extensive range of services
- Training possibilities by our specialised service personnel.

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1 TECHNICAL DATA for ERICO **SBM-drilling machines**

1.1 Rail drilling machine type SBM-V

Max. drill diameter	36 mm (hollow core drill)
Tool holding fixture	Weldon shaft 19 mm
Max. feed	50 mm
Spindle speed	267 r.p.m. for drill diameters up to 24 mm 212 r.p.m. for drill diameters from 25 to 36 mm
Tool cooling system	Internal tool cooling system for hollow core drills with automatic coolant valve opening
Drive	Two stroke engine
Power	1.4 kW with 6500 r.p.m.
Piston displacement	49 cm ³
Starter	Starter cord
Clutch	Autom. centrifugal clutch
Fuel	1:25 mixture
Tank volume	1 l
Consumption	about 850 g/h
Gear oil	SAE 75-W90, API GL 4
Gear volume	70 ml
Length	330 mm
Height	480 mm
Width	270 mm
Weight (without fastening device)	approx. 13 kg
Rail head fastening device for Vignoles rails BSK 1* (Art. No. 715360)	approx. 3 kg
Rail head fastening device for grooved rails BSK 2* (Art. No. 715370)	approx. 4 kg
Rail foot fastening device for Vignoles rails BSF 1* (Art. No. 715380)	approx. 4 kg
Templates	Available for all common rail types.*

* Not included in the extent of delivery for SBM-V machines.

1.2 Technical data for Rail drilling machine type SBM-E-48 Volt DC

Max. drill diameter	24 mm (hollow core drill)
Tool holding fixture	Weldon shaft 19 mm
Max. feed	50 mm
Spindle speed	391 r.p.m. for drill diameters up to 24 mm
Tool cooling system	Internal tool cooling system for hollow core drills with automatic coolant valve opening
Drive Power Voltage Gear oil Gear volume	Direct-current disc drive engine 0.62 kW with 6500 r.p.m. 48 Volt DC SAE 75-W90, API GL 4 60 ml
Length Height Width	330 mm 450 mm 190 mm
Battery pack E. No.715357	48 Volt/ 7.2 Amp.hours
Weight battery pack	11.5 kg
Charging device E. No. 715425	48 Volt/ 1 Amp charging current – IP 20
Weight charging device	Approx. 1 kg
Weight (without fastening device)	Approx. 12 kg
Rail head fastening device for Vignoles rails BSK 1* (Art. No. 715360)	approx. 3 kg
Rail head fastening device for grooved rails BSK 2* (Art. No. 715370)	approx. 4 kg
Rail foot fastening device for Vignoles rails BSF 1* (Art. No. 715380)	approx. 4 kg
Templates	Available for all common rail types.*

* Not included in the extent of delivery for SBM-E 48 Volt DC machines.

1.3 Technical data for rail drilling machine type SBM-E-230 Volt AC

Max. drill diameter	36 mm (hollow core drill)
Tool holding fixture	Weldon shaft 19 mm
Max. feed	50 mm
Spindle speed	280 r.p.m. for drill diameters up to 24 mm 220 r.p.m. for drill diameters from 25 to 36 mm
Tool cooling system	Internal tool cooling system for hollow core drills with automatic coolant valve opening
Drive Power Voltage Gear oil Gear volume	Alternating current engine 1.4 kW 230 Volt AC SAE 75-W90, API GL 4 70 ml
Length Height Width	330 mm 450 mm 250 mm
Weight (without fastening device)	about 12 kg
Rail head fastening device for Vignoles rails BSK 1* (Art. No. 715360)	approx. 3 kg
Rail head fastening device for grooved rails BSK 2* (Art. No. 715370)	approx. 4 kg
Rail foot fastening device for Vignoles rails BSF 1* (Art. No. 715380)	approx. 4 kg
Templates	Available for all common rail types.*

* Not included in the extent of delivery for SBM-E 230 Volt machine

2 Safety Instructions

- Read the Operating Instructions prior to starting up the machine!
- Keep these Operating Instructions with the machine during its complete serviceable life!
- Use the drilling machine according to its proper purpose only!
- It is imperative to observe the rules for prevention of accidents when working on railway lines being in use!
- Wear safety glasses!
- Wear work gloves!
- Tie long hair together!
- Wear a hairnet to protect very long hair!
- Wear safety boots!
- Take jewellery off prior to starting work!
- Do not put your hands into running tools!
- The employer is obliged to have made the Operating Instructions accessible to the user and has to make sure that the user has read and understood them.

Symbols



Technical instructions for application
Please observe them strictly to avoid damage to the appliance.



Technical instructions for safety.
Please observe them strictly to avoid personal injury and damage to the environment.

3 Extent of delivery for complete drilling units

3.1 Drilling unit SBM-VS (Art. No. 715685)

- Drilling unit SBM-VS (267 r.p.m.) (Art. No. 715462)
- Sheet steel box for the drilling unit (Art. No. 715695)
- Coolant receptacle (Art. No. 715375)
- Grease gun (Art. No. 715830)
- Tooling set, (Art. No. 715395)

contents tooling set (Art. No. 715395) :

- ⇒ Set screw M 10x8 to fasten twist drills or hollow core drills (4 pieces)
- ⇒ Cheese head screw M 6x16 incl. Washers to fasten rail profile templates (4 pieces)
- ⇒ Cheese head screw M 8x20 incl. washers to fix clamping arms BSK 1 and BSK 2 (4 pieces)
- ⇒ Allan key 5 mm (1 piece)
- ⇒ Allan key 6 mm (1 piece)
- ⇒ Allan key with T-handle 5 mm (1 piece)
- ⇒ Cleaning brush (1 piece)
- ⇒ Spark plug spanner (1 piece)
- ⇒ Positioning pin for slight machine positioning (1 piece)
- ⇒ Allan key with T-handle 4 mm (1 piece) for twist drill adapter

3.2 Extent of delivery for complete drilling unit

SBM-VL (Art. No. 715460)

- Drilling unit SBM-VL (212 r.p.m.) (Art. No. 715461)
- Sheet steel box for the drilling unit (Art. No. 715695)
- Coolant receptacle (Art. No. 715375)
- Grease gun (Art. No. 715830)
- Tooling set, (Art. No. 715395)

contents tooling set (Art. No. 715395) :

- ⇒ Set screw M 10x8 to fasten twist drills or hollow core drills (4 pieces)
- ⇒ Cheese head screw M 6x16 incl. Washers to fasten rail profile templates (4 pieces)
- ⇒ Cheese head screw M 8x20 incl. washers to fix clamping arms BSK 1 and BSK 2 (4 pieces)
- ⇒ Allan key 5 mm (1 piece)
- ⇒ Allan key 6 mm (1 piece)
- ⇒ Allan key with T-handle 5 mm (1 piece)
- ⇒ Cleaning brush (1 piece)
- ⇒ Spark plug spanner (1 piece)
- ⇒ Positioning pin for slight machine positioning (1 piece)
- ⇒ Allan key with T-handle 4 mm (1 piece) for twist drill adapter

3.3 Extent of delivery for complete drilling unit

SBM-E48V-DC (Art. No. 715400)

- Drilling unit SBM-E/48V (391 r.p.m.) (Art. No. 715356)
- Sheet steel box for the drilling unit (Art. No. 715695)
- Battery pack 48 Volt / 7.2 Ah (Art. No. 715357)
- Battery charger 48 Volt / 1A (Art. No. 715425)
- Coolant receptacle (Art. No. 715375)
- Grease gun (Art. No. 715830)
- Tooling set, (Art. No. 715395)

contents tooling set (Art. No. 715395) :

- ⇒ Set screw M 10x8 to fasten twist drills or hollow core drills (4 pieces)
- ⇒ Cheese head screw M 6x16 incl. washers to fasten rail profile templates (4 pieces)
- ⇒ Cheese head screw M 8x20 incl. washers to fix clamping arms BSK 1 and BSK 2 (4 pieces)
- ⇒ Allan key 5 mm (1 piece)
- ⇒ Allan key 6 mm (1 piece)
- ⇒ Allan key with T-handle 5 mm (1 piece)
- ⇒ Cleaning brush (1 piece)
- ⇒ Spark plug spanner (1 piece)
- ⇒ Positioning pin for slight machine positioning (1 piece)
- ⇒ Allan key with T-handle 4 mm (1 piece) for twist drill adapter

3.4 Extent of delivery for complete drilling unit

SBM-E230-VS (280 r.p.m.) Art. No. 715404

- Drilling unit SBM-E/230VS (280 r.p.m.) (Art. No. 715402)
- Sheet steel box for the drilling unit (Art. No. 715695)
- Coolant receptacle (Art. No. 715375)
- Grease gun (Art. No. 715830)
- Safety extension cable (Art. No. 715338)
- Tooling set, (Art. No. 715395)

3.5 Extent of delivery for complete drilling unit

SBM-E230VL (220 r.p.m.) Art. No. 715406

- Drilling unit SBM-E230VL (Art. No. 715403)
- Sheet steel box for the drilling unit (Art. No. 715695)
- Coolant receptacle (Art. No. 715375)
- Grease gun (Art. No. 715830)
- Safety extension cable (Art. No. 715338)
- Tooling set, (Art. No. 715395)

contents tooling set (**Art. No. 715395**) :

- ⇒ Set screw M 10x8 to fasten twist drills or hollow core drills (4 pieces)
- ⇒ Cheese head screw M 6x16 incl. washers to fasten rail profile templates (4 pieces)
- ⇒ Cheese head screw M 8x20 incl. washers to fix clamping arms BSK 1 and BSK 2 (4 pieces)
- ⇒ Allan key 5 mm (1 piece)
- ⇒ Allan key 6 mm (1 piece)
- ⇒ Allan key with T-handle 5 mm (1 piece)
- ⇒ Cleaning brush (1 piece)
- ⇒ Spark plug spanner (1 piece)
- ⇒ Positioning pin for slight machine positioning (1 piece)
- ⇒ Allan key with T-handle 4 mm (1 piece) for twist drill adapter

4 AVAILABLE ACCESSORIES

4.1 Clamping arm BSK 1 with Quick-Loosening Device for Vignoles Rails (Art. No. 715360)

- Complete, including:
- Clamping wheel, big, for Vignoles rail

4.2 Clamping arm BSK 2 with Quick-Loosening Device for grooved Rail (Art. No. 715370)

Complete, including small clamping wheels

4.3 Clamping arm BSF 1 for Rail Foot Fixing (Art. No. 715380)

Usable for rail foot widths up to max. 150 mm.
This clamping arm allows the lying (!) drilling unit to remain fixed to the rail while rail traffic is being maintained.

4.4 Metal Box for Accessories (Art. No. 715515)

To keep the complete accessories.
(E.g. drills, cooling pins, drilling templates and tools)

4.5 Universal Template (Art. No. 715365)

To fix the drilling machine to the following Vignol rail types at the respective standard drilling height (measured from the lower edge of the rail) with rail head fastening device BSK 1 and rail foot fastening device BSF 1: S 49 (62.5 mm), S 54 (64 mm), UIC 60 (76.3 mm)
These templates are also available as individual ones.

4.6 Special Templates

For all common rail types (special dimensions on request)

4.7 Distance Gauges

For insulated rail joints and axle counters.

4.8 Rail Drills with accessories

Great variety of drills from 8 to 36 mm in diameter.
We gladly offer the addresses of several suppliers of grinding services for our different rail drill types.

4.9 Distance Gauges and special Profile Templates

(See chapter 9 for more detailed information.)

5 Delivery program rail drills

ERICO has a comprehensive assortment of drilling machines for the most varied drilling jobs for all Railway rail track profiles.

All drill types are delivered with a Weldon mounting shaft \varnothing 19, or an adapter for this standardised mounting shaft.

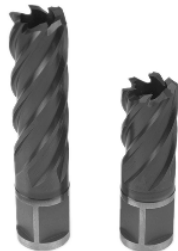
All drills are provided with a TIALN coating which guarantees an optimal tool life.

5.1 SBPM or SBPML high performance hollow core drills:



- Material: powder metal HSS-XE Steel
- Coating: TIALN Multilayer-coating
- \varnothing -range: 16 to 22 mm
- Drill length: SBPM=70mm, SBPML=90mm
- Drill performance: Approx. 100 times drilling
- Application: All rail types
- Regrinding: Approx. 5 x

5.2 SB or SBL disposable hollow core drills:



- Material: HSS-XE Steel
- Coating: TIALN coating
- \varnothing -range: 16 to 22 mm
- Drill length: SB=70mm, SBL=90mm
- Drill performance: Approx. 40 times drilling
- Application: Rail types up to 850 N/mm²
- Regrinding: Economically not cost-effective

5.3 SBV 19 high performance solid drills: Triple cutting action



- Material: Powder metal HSS Steel
- Coating: TIALN coating
- \varnothing -range: Only 19mm
- Drill length: 70mm
- Drill performance: Approx. 100 times drilling
- Application: All rail types (very good centring characteristics)
- Regrinding: Yes, approx. 5 x

5.4 SBHM or SBHML hollow core drills (hard metal tipped)



- Material: Hard metal tipped hollow core drills
- \varnothing -range: 18 – 32 mm
- Drill length: SBHM=74mm, SBHML=90mm
- Drill performance: Approx. 50 times drilling
- Application: All rail types
- Regrinding: Depending on circumstances approx. 5x

to 5.1 Delivery program high performance hollow core drills Type SBPM (l=70mm) and SBPML (l=90mm)

Diameter	Drill type	ERICO No.	Cooling pin Ø x l	ERICO No.
16	SBPM 16	716306	6,3 x 83	715660
16	SBPML 16	716307	6,3 x 104	715670
17	SBPM 17	716324	6,3 x 83	715660
17	SBPML 17	716308	6,3 x 104	715670
18	SBPM 18	715274	6,3 x 83	715660
18	SBPML 18	716309	6,3 x 104	715670
19	SBPM 19	715270	6,3 x 83	715660
19	SBPML 19	716310	6,3 x 104	715670
20	SBPM 20	715272	6,3 x 83	715660
20	SBPML 20	716311	6,3 x 104	715670
22	SBPM 22	715030	6,3 x 83	715660
22	SBPML 22	715280	6,3 x 104	715670

to 5.2 Delivery program rails hollow core drill Type SB (l=70mm) and SBL (l=90mm)

Diameter	Drilling type	ERICO No.	Cooling pin Ø x l	ERICO No.
16	SB 16	715251	6,3 x 83	715660
16	SBL 16	716301	6,3 x 104	715670
17	SB 17	715252	6,3 x 83	715660
17	SBL 17	716302	6,3 x 104	715670
18	SB 18	715253	6,3 x 83	715660
18	SBL 18	716303	6,3 x 104	715670
19	SB 19	715250	6,3 x 83	715660
19	SBL 19	716304	6,3 x 104	715670
20	SB 20	715254	6,3 x 83	715660
20	SBL 20	716305	6,3 x 104	715670
21	SB 21	715256	6,3 x 83	715660
21	SBL 21	716312	6,3 x 104	715670
22	SB 22	715255	6,3 x 83	715660
22	SBL 22	715260	6,3 x 104	715670

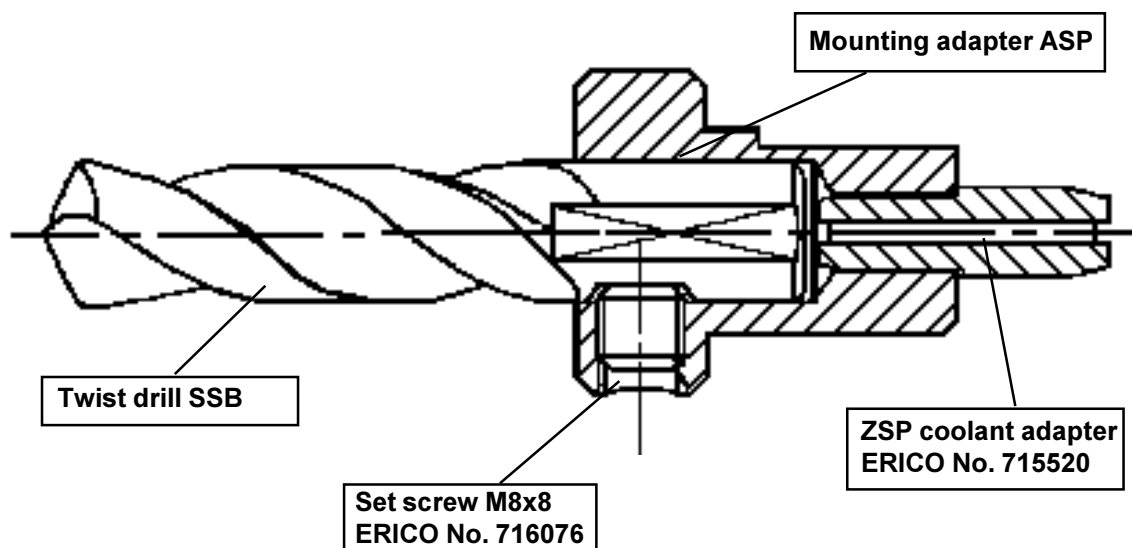
**to 5.3 Delivery program high performance hollow core drill
Hard metal tipped
Type SBHM (l=74mm) and SBHML (l=90mm)**

Diameter	Drill typw	ERICO No.	Cooling pin Ø x l	ERICO No.
16	SBHML 16	716353	6,3 x 104	715670
17	SBHML 17	716354	6,3 x 104	715670
18	SBHM 18	716344	7,98 x 86	715320
18	SBHML 18	??	7,98 x 104	715315
19	SBHM 19	716345	7,98 x 86	715320
19	SBHML 19	716355	7,98 x 104	715315
20	SBHM 20	716346	7,98 x 86	715320
20	SBHML 20	716356	7,98 x 104	715315
22	SBHM 22	715305	7,98 x 86	715320
22	SBHML 22	715310	7,98 x 104	715315
23	SBHM 23	716322	7,98 x 86	715320
24	SBHM 24	716321	7,98 x 86	715320
24	SBHML 24	716327	7,98 x 104	715315
25	SBHML 25	716328	7,98 x 104	715315
26	SBHM 26	716323	7,98 x 86	715320
26	SBHML 26	716329	7,98 x 104	715315
28	SBHM 28	716316	7,98 x 86	715320
28	SBHML 28	716331	7,98 x 104	715315
30	SBHM 30	716318	7,98 x 86	715320
30	SBHML 30	716332	7,98 x 104	715315
31	SBHM 31	716314	7,98 x 86	715320
31	SBHML 31	716337	7,98 x 104	715315
32	SBHM 32	716317	7,98 x 86	715320
32	SBHML 32	716333	7,98 x 104	715315
33	SBHM 33	716319	7,98 x 86	715320
33	SBHML 33	716334	7,98 x 104	715315
34	SBHM 34	716351	7,98 x 86	715320
34	SBHML 34	716357	7,98 x 104	715315
36	SBHML 36	716358	7,98 x 104	715315

**to 5.4 Delivery program high performance drill
(triple cutting action) Type SBV 19**

Diameter	Drill type	ERICO No.	Cooling pin Ø x l	ERICO No.
19	SBV 19	715265	-----	-----

5.5 Delivery program double cutting twist drill type SSB with mounting and cooling adapter



- Material: HSS_XE Steel
- Coating: TIALN
- Ø-range: 8 – 19 mm
- Drill length: 70mm
- Drill performance: Approx. 30 times drilling
- Application: All rail types
- Regrinding: approx. 10 x

The coolant adapter is generally used with all SSB-drills

The following drills and adapters are available:

Diameter	SSB type	ERICO No.	Adapter Type incl. Setscrew M8 x 8	ERICO No.	Coolant adapter ZSP ERICO No.
Ø 8	SSB 8	716315	ASP 8	716074	715520
Ø 9,5	SSB 9,5	716181	ASP 9,5	716177	715520
Ø 10,5	SSB 10,5	716182	ASP 10,5	716178	715520
Ø 12	SSB 12	716183	ASP 12	716179	715520
Ø 13	SSB 13	716320	ASP 13	716180	715520
Ø 13,5	SSB 13,5	716184	ASP 13	716180	715520
Ø 14	SSB 14	716186	ASP 13	716180	715520
Ø 15	SSB 15	716187	ASP 13	716180	715520
Ø 16	SSB 16	716188	ASP 13	716180	715520
Ø 17	SSB 17	716189	ASP 13	716180	715520
Ø 18	SSB 18	716191	ASP 13	716180	715520
Ø 19	SSB 19	716185	-----	-----	715520

Following sets (drills, adapter incl. setscrew an coolant adapter) are available

Diameter	Description	ERICO No.
Ø 8	drill set - SSB 8	715036
Ø 13	drill set - SSB 13	715037

To increase serviceable life, we recommend:

1. **ERICO** High efficiency grease spray FS 5000, 400 ml can (Art. No. 715285)
2. **ERICO** Coolant type LR-1, 5 l concentrate (art. no. 715075)
3. **ERICO** Antifreeze LP7729, 5 l concentrate (art. no. 715080) for working in freezing conditions

To prepare the emulsion please adhere to the following mixing table:

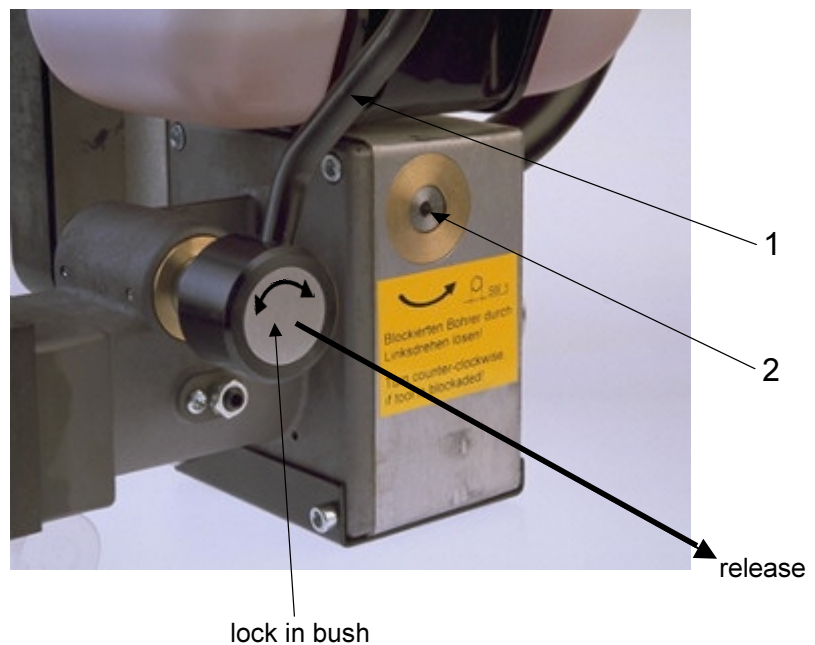
Antifreeze up to	Cooling lubricant LR-1		Water		Ethylene glycol LP-7729	
	Litres*	%	Litres*	%	Litres*	%
0 ° C	0.35	7	4.65	93	without	0
-2° C	0.35	7	4.40	88	0.25	5
-3° C	0.35	7	4.15	83	0.50	10
-5° C	0.35	7	3.90	78	0.75	15
-8° C	0.35	7	3.65	73	1.00	20
-12° C	0.35	7	3.40	68	1.25	25
-15° C	0.35	7	3.15	63	1.50	30

6 Preparing the Drilling unit for Drilling

6.1 Extending the Drill Spindle to its Final Position for Changing the Drill


- The engine must be switched off when working on the drill spindle and disconnected from the power supply!
- Extend the drill spindle forwards to make both setscrews accessible. For this purpose, pull the feed lever (1) backwards.
- By unlatching the system, the feed lever can be shifted to the most favourable position without moving the drill spindle. For release, pull the feed lever (1) outwards taking it by the lock-in bush.
- If necessary, the drill spindle can be twisted manually. For this, insert the hex driver SW 5 mm into the hexagon socket (2) of the gear shaft and turn it to the right or left until having easy access to the respective drill fixing set screw.

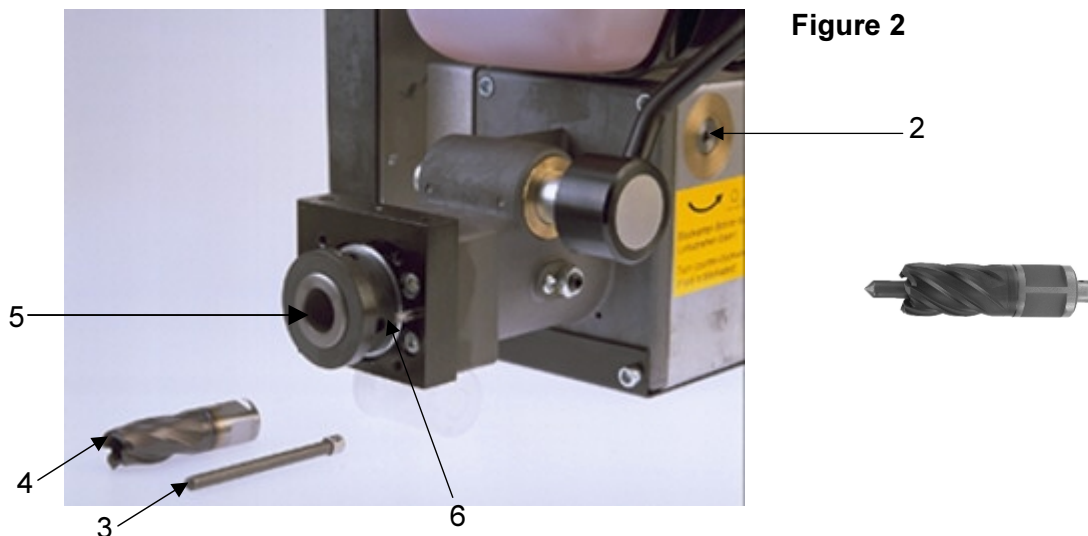
Figure 1




6.2. Inserting Hollow Core Drills

6.2.1. (SBPM and SBPML, SB and SBL as well as SBHM and SBHML)

- Introduce the respective centring and cooling pin (3) from the back into the hollow core drill (4).
- Check drill spindle mount (5) for cleanliness and clean it, if necessary.
- Insert the hollow core drill (4) with the centring and cooling pin (3) into the spindle making its clamping surfaces and the clamping screws (6) of the spindle virtually coincide with each other.
- Attention! Sharp cutting edges! Wear gloves to avoid personal injury. 
- Tighten both clamping screws (6) by means of the 5 mm hex driver.
- Check the centring and cooling pin for correct position. It has to spring back when pressing the pinpoint.



6.2.2. Inserting Solid Drills SBV19 and SSB19

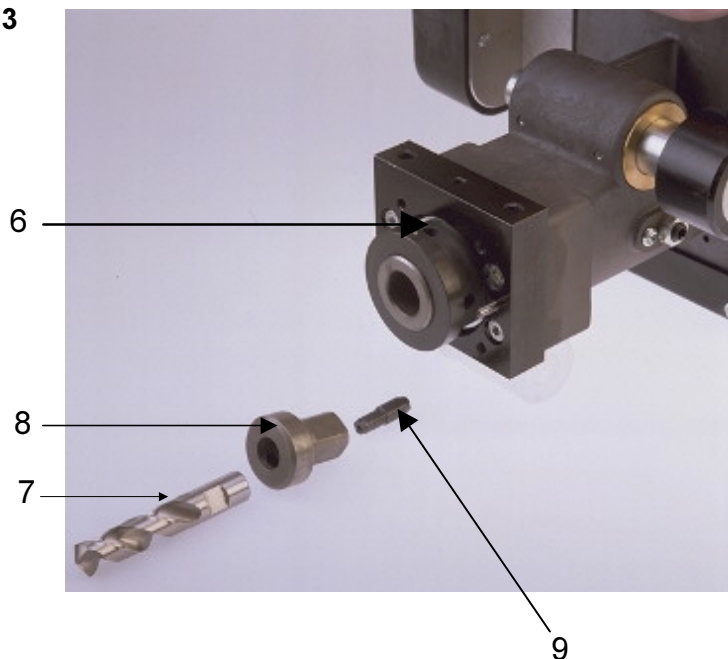
- Check drill spindle mount for cleanliness and clean it, if necessary.
- Insert the solid drill into the spindle making its clamping surface and the clamping screws (6) of the spindle coincide with each other.
- Attention! Sharp cutting edges! Wear gloves to avoid personal injury. 
- Tighten both clamping screws (6) by means of the 5 mm hex driver. If necessary, turn the gear shaft (2) (see figure 1, page 19) beforehand to make the respective screw accessible.

6.2.3 Inserting Twist Drills SSB Ø 8 to Ø 18

- First, introduce the drill (7) into the appropriate adapter (8) (see table on page 11).
- Doing this, take care that the drill clamping surface (7) faces the adapter clamping screw correctly.
- Insert the intermediary ZSP (9) into the adapter.
- Introduce drill (7), adapter (8) and intermediary ZSP (9) into the spindle to make the clamping surfaces of the adapter and the clamping screws (6) of the spindle coincide with each other.
- Attention! Sharp cutting edges! Wear gloves to avoid personal injury.
- Tighten both clamping screws (6) by means of the 5 mm hex driver.



Figure 3



6.3 Connecting the Coolant Receptacle (Art. No. 715375)

- The coolant receptacle consists of a plastic receptacle with hose, pressure control valve, shut-off valve and quick release coupling.
- An integrated hand pump is used for pressure build-up.
- Connect the hose of the coolant receptacle to the coolant connector of the drilling unit (11) by means of the quick release coupling (10). Close the shut-off valve (12) of the receptacle when coupling.

Figure 4a

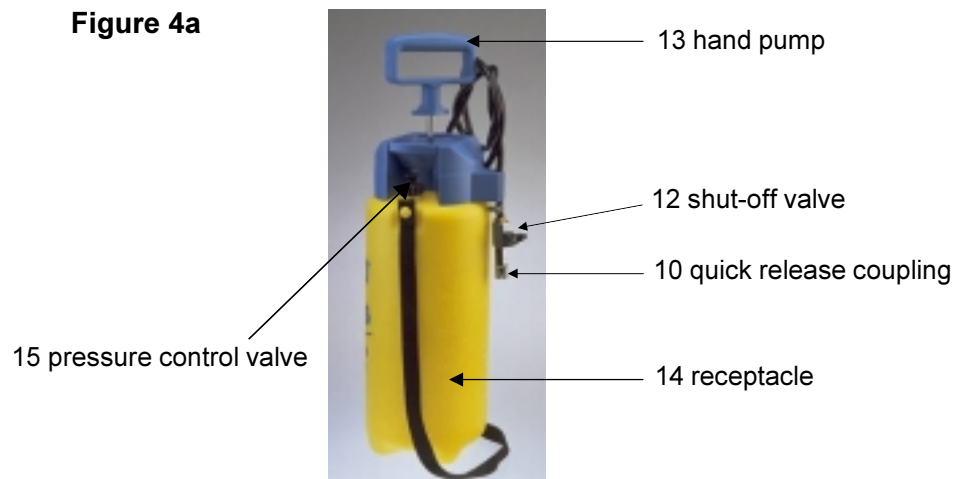
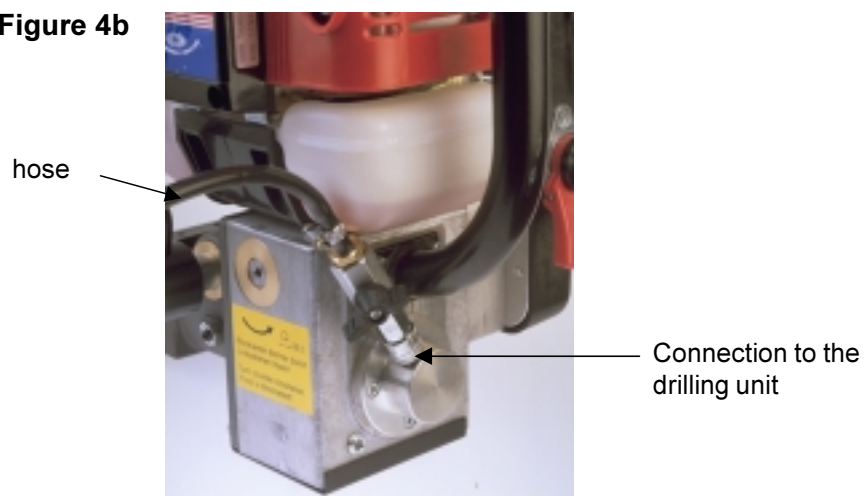


Figure 4b



6.3.1 Setting the Coolant Receptacle into Operation

(See figure 4a and 4b)

- Unscrew the pump (13) by turning it counter-clockwise. Beforehand, unlock the sucker rod, turn it 180° and by applying pressure on the locking pens on the pump house transfer the screw power.
- Fill the receptacle (14). Do not exceed the maximum filling amount of 3l.
- Operate the pump (13) until the working pressure in the receptacle will have got up to 1 bar (green marking at the manometer (15)). Usually, 2 to 3 pumping movements are enough to achieve a sufficient feed pressure.
- Open the valve (12) after coupling the receptacle to the drilling unit. Now the cooling device is ready for work.
- Close the valve (12) prior to uncoupling the coolant receptacle.
- Lift the manometer (15) to blow off the residual pressure of the receptacle through the safety valve.
- Store the receptacle always unpressurized.
- When the receptacle is not in use for a longer time, empty it, clean it and let it open for drying.
- If possible, use only clean water for cooling the tool.
- Use cooling lubricants or additives only if the draining off coolant can be collected completely.



Notes for use in temperatures below 0°C:

- In temperatures below zero there is the risk of the coolant to freeze and damage the machine.
- Please use the appropriate **ERICO** antifreeze Type LP 7729 / ERICO Art. No. 715080 in accordance with mixture table page 18.



When the device is not in use for a longer time, the coolant still present in the drilling unit has to be removed as follows:

- Uncouple the coolant receptacle.
 - Turn the machine so that the coolant connector (11) is facing downward.
 - Move the feed lever (1) to and fro until no more coolant is coming out of the connector (11).
- (See figure 1 and figure 4b)

6.3.2 External tool Cooling (Art. Nr. 715525)

By means of the adapter AAK you can cool a drill externally.

Push the adapter AAK (16) simply on the quick coupler (10) of the coolant receptacle.

It can also be used for cleaning the drill mount in the spindle.

Figure 4c

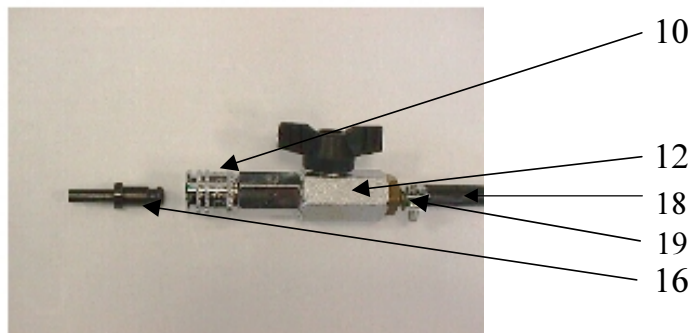


Figure 4a

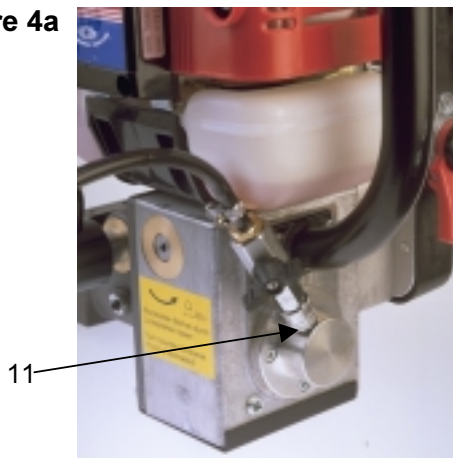
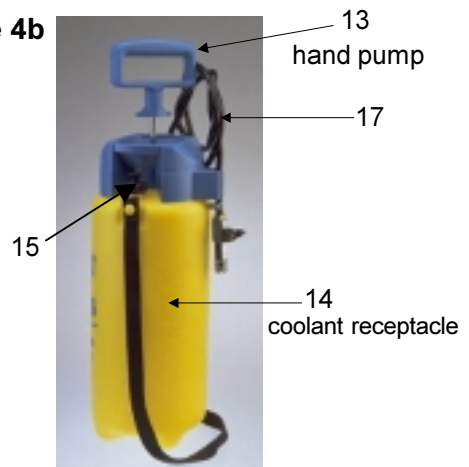


Figure 4b



Item	Pieces	Designation	Art. No.
10	1	Quick release coupling	715550
11	1	Coupling plug at the drill unit	715781
12	1	Shut-off valve	715565
13	1	Hand pump	no spare part
14	1	Coolant receptacle	no spare part
15	1	Safety valve	no spare part
16	1	Adapter for external cooling	715525
17	1	Coolant hose	715676
18	1	Hose sleeve	715570
19	1	Hose clamp	715580

Coolant hose compl. Art. No. 715677 (715570; 715580; 715550)

In case of damaging the coolant receptacle can only be replaced in its entirety under ERICO-No. 715375.

7 Attaching the Machine to the Track

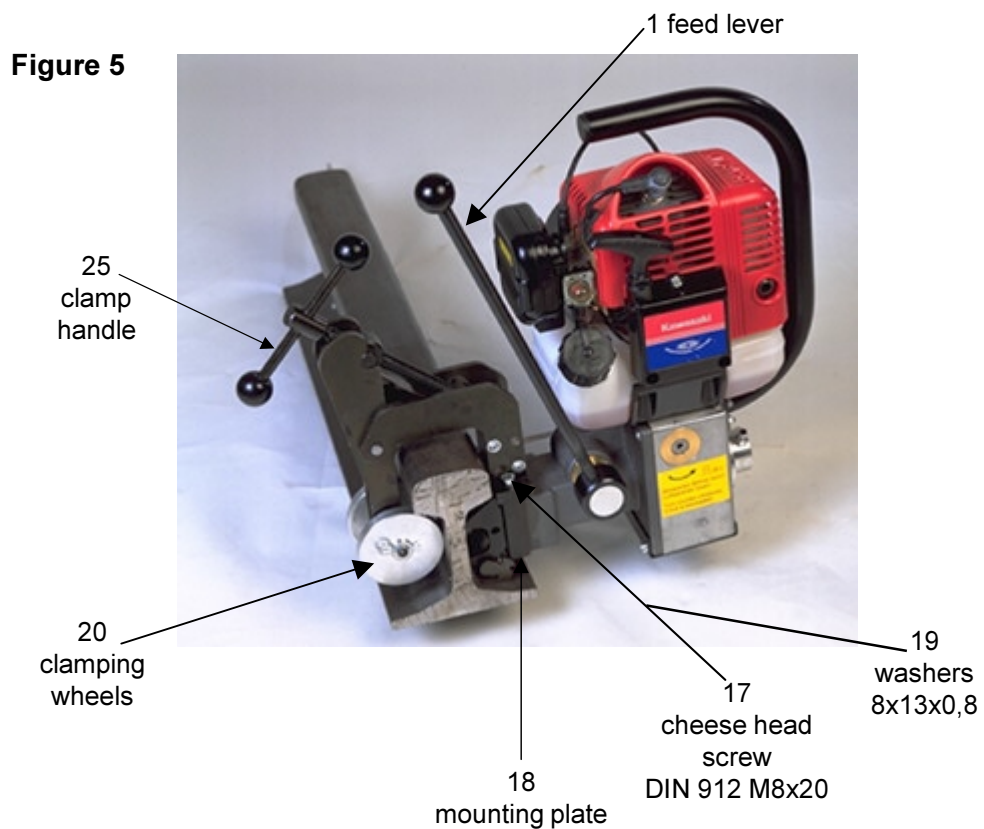
7.1 Mounting the Clamping Arms BSK 1 and BSK 2 to the Drilling Machine

The clamping arms BSK 1 and BSK 2 are fixed with 2 screws (17) on top of the mounting plate (18) of the drilling unit.

Use the appropriate washers (19) to avoid loosening of the DIN912-M8x20 screws.

When fixing the clamping arms, make sure that the parallel pin of the clamping arm is introduced precisely into the drill-hole of the mounting plate. Attach the clamping wheels (20) according to the respective application.

The big wheels can be used for Vignoles rails (BSK 1 to rails) and the small ones for both Vignoles (BSK 2 to cross frog and shunts) as well as grooved rails (BSK 2).

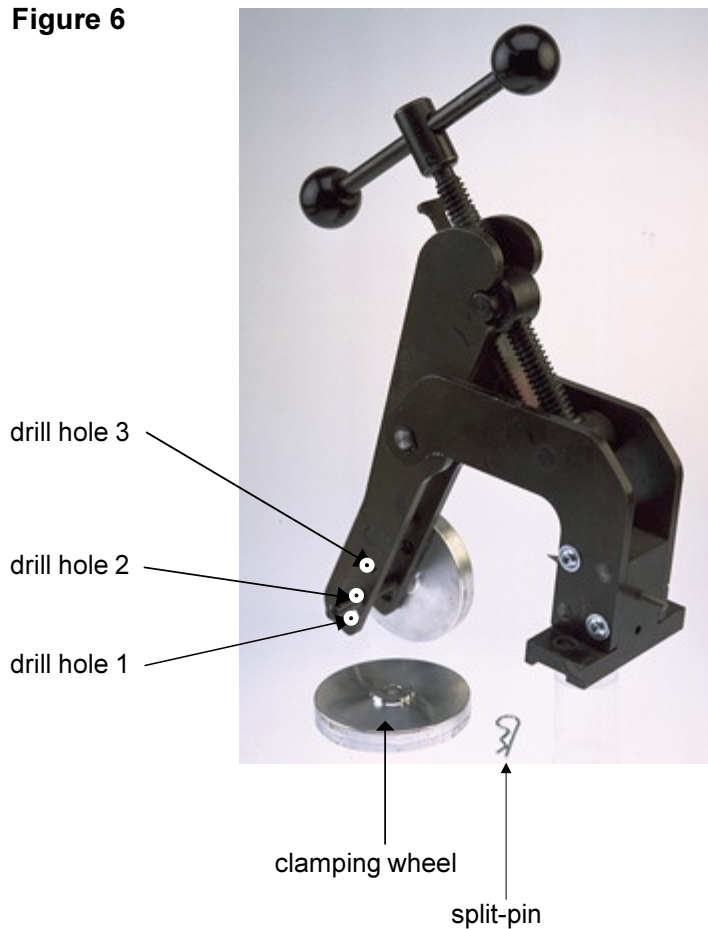


7.2 Correct mounting position of the clamping wheels

When using the rail head fastening device BSK 1 and our universal template (Art. No. 715365) for drilling work on UIC60, S49 and S54 rails, the clamping wheel floating axle generally has to be inserted in drill hole 2.

Drill holes 1 and 3 have been provided for special applications and other rail types. Always make sure that the insertion point of the clamping wheels on the stem of the rail is in line with the centre of drilling (height).

Figure 6



7.3 Adjusting the Universal Profile Template

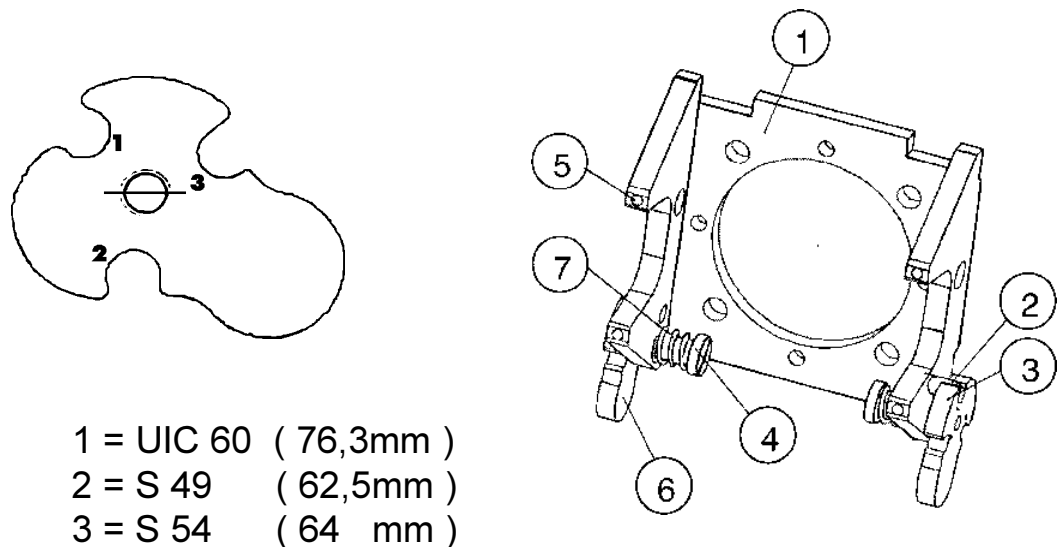
(ERICO-No. 715365)

The universal profile template is suitable for the following rail types (drilling height measured from the lower edge of the rail):

S 49 (62.5 mm), S 54 (64 mm), UIC 60 (76.3 mm)

The universal template is adapted to the different rail types by adjusting the two eccentric plates (23) (see figure 8b).

- For this purpose, press the spring bolt (24) from the inside of the template.
- Turn the eccentric plates (23) up to the respective hole and lock them.
- Make absolutely sure that both eccentric plates (23) are equally adjusted!
- Mounting on the mounting plate as described under item 7.4.



1 = UIC 60 (76,3mm)
 2 = S 49 (62,5mm)
 3 = S 54 (64 mm)

Item	Pieces	Designation	Art. No.
1	1	Korpus universal templates	716230
2	2	Dowel	715451
3	1	Excentric plate right	716250
4	2	Flange bolt	716240
5	4	Pen with stud	716225
6	1	Excentric plate left	716220
7	2	Spring	716235

For the above indicated rail types, individual templates are also available.
 More template types and drilling heights on request.

7.4 Mounting the Rail Profile Templates

The rail profile templates are fastened with 2 screws each (21) to the mounting plate (18) of the drilling unit.

Use the appropriate washers (22) to avoid loosening of screws while working.

The inscription on the template (designation of the rail type) always has to face the rail foot.

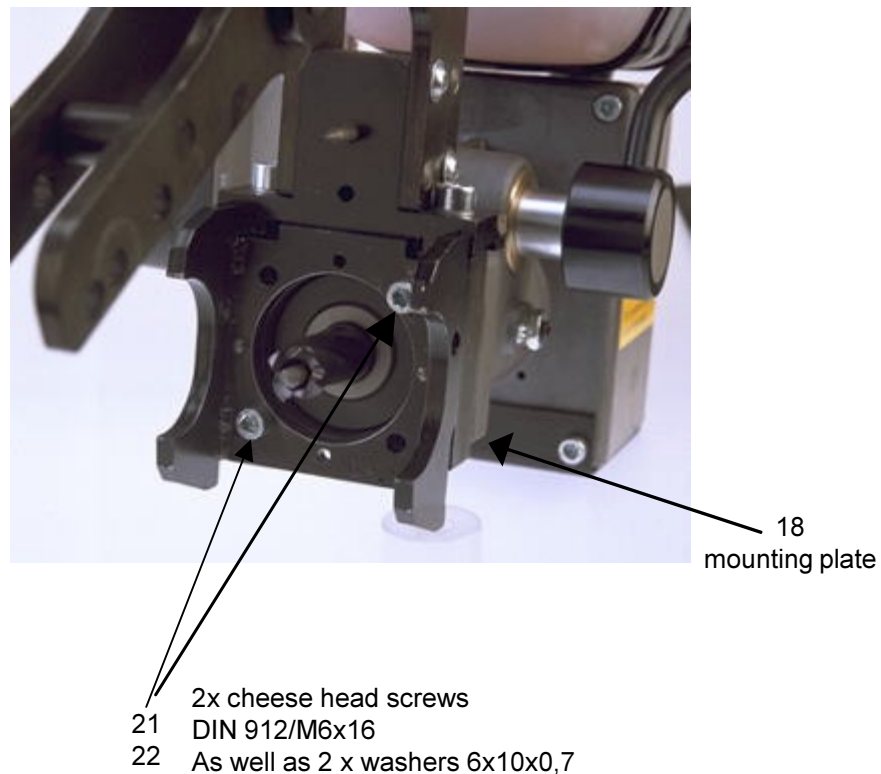
Always use the template that is suitable for the respective rail type.

When using the universal template, make absolutely sure that the correct rail type has been adjusted (see chapter 7.1.2).

Tighten the fastening screws again after drilling about 15 holes.



Figure 7



7.5 Attaching the Completely Prepared Drilling Unit to the Rail (see figure 5 page 25).

- Move the drill spindle completely back by means of the feed lever (1).
- Open the clamping arm, hang around the rail head and position the spindle nut in the lock.
- Position the drilling unit on the rail and fasten it by turning the clamp handle (25) clockwise. Provided the clamping wheels are correctly positioned, finger tight fastening will be sufficient.
- To detach the machine, shift the drill spindle back, release the clamp handle (25) by turning it about 2 revolutions and remove the machine backwards from the rail.

7.5.1 Mounting the Clamping Arm BSF 1


7.5.2. Mounting the Rail Profile Template to the Rail Foot Fastening Device BSF 1

The rail profile template is fixed to the clamping arm BSF 1 by means of 2 special screws (9). Take care that the inscription of the template is facing the rail foot.

The clamping arm BSF 1 has two drill holes marked with the letters A and B which are provided for attaching the rail profile templates. They have to correspond to the respective drill holes of the templates, i.e. a rail profile template marked with A will be connected to the clamping arm through drill hole A.

The appropriate drill holes for fixing the universal template are given in the table below.

7.5.3. Mounting the Rail Foot Fastening Device BSF 1 to the Drilling Machine

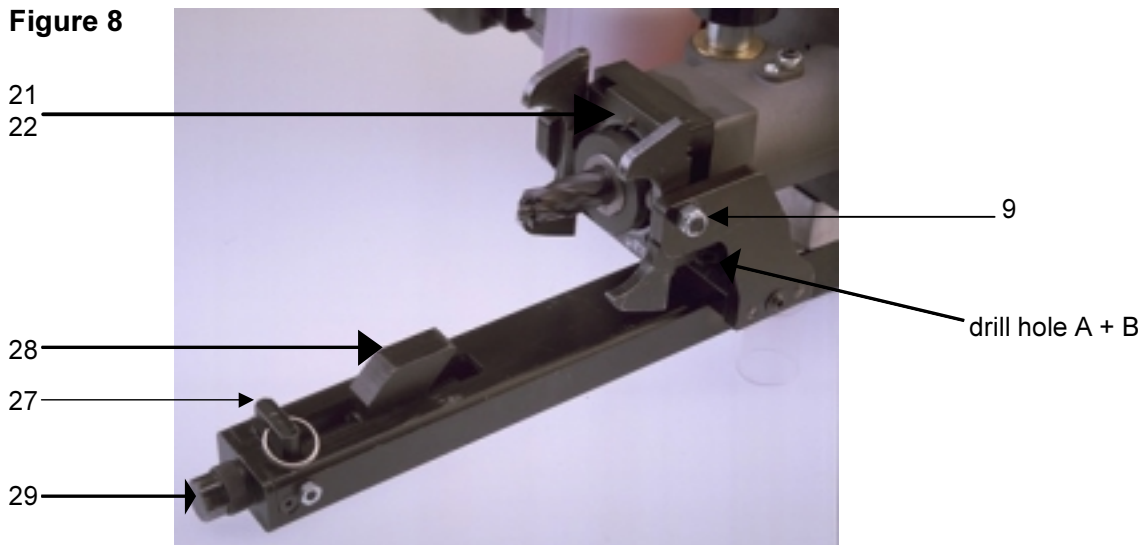
- Attach the clamping arm with the rail profile template screwed down, to the drilling machine.
- **For this, turn the drilling machine so that the feed lever (1) is in top position. Only then is rail traffic possible with the drilling unit mounted! (See figures 9 and 19)**
When doing this the feed lever must never be protrude from the rail head. 
- Fasten the rail profile template by means of two Allan screws (21) to the mounting plate (18) of the drilling unit.
- Use the appropriate washers (22) (Schnorr washers 6x10x0.7) to avoid loosening of screws during the operation.
- In each case, use the template that is suitable for the respective rail type.
- When using the universal template, make absolutely sure that the correct rail type has been adjusted (see chapter 7.3).

Note to 7.5.3 (page 29)

Drill hole marking for universal template when mounting Rail Foot Fastening Device BSF 1.

Rail type adjusted in universal template	Drill hole marking
UIC 60	A
S 49	B
S 54	B

Figure 8

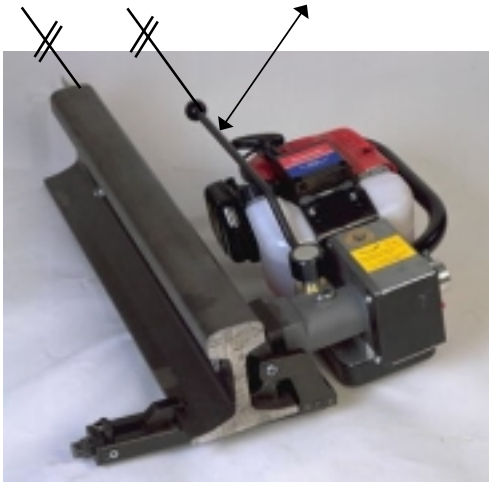


7.5.4 Attaching the Prepared Drilling Unit to the Rail

- Open the lock (27) so that the clamping claw (28) and the spindle (29) are extended completely.
- Shift the clamping arm BSF 1 at an angle through below the rail foot.
- After having the drilling machine correctly positioned, push the clamping claw (28) to the rail foot and let the lock (27) engage. After that, tighten the spindle (29) slightly by means of a 19 mm hexagon spanner. Now lift the drilling unit a bit to allow the template to put itself uniformly against the stem of the rail. Tighten the clamping device in this position.
- To detach the drilling device from the rail, loosen the spindle (29) by means of the 19 mm hexagonal spanner to such an extent that the lock (27) can be opened. Now withdraw the spindle (29) with the clamping claw (28) and remove the drilling unit from the rail.
- **Attention! This manner of fastening always requires that the machine is lying down and the feed lever does not protrude from the rail head, but is parallel to the rail. In case of non-observance there is acute danger to life!**

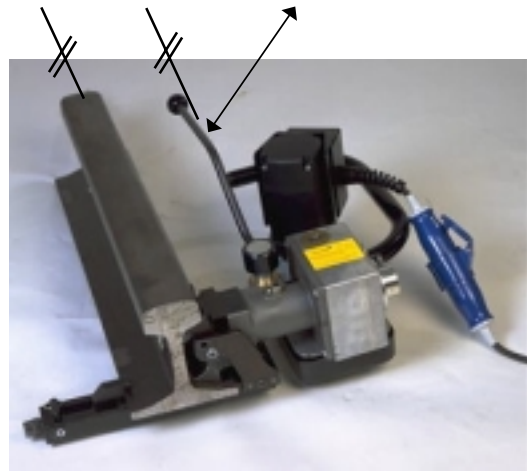


Figure 9



SBM-V with attachment BSF1

Figure 10



SBM-E230 with attachment BSF1

8 Starting the Engine

8.1 Starting the engine for drilling machine type SBM-V

- Make sure that there is sufficient fuel in the tank (1:25 mixture).
- Change the ignition switch (30) over to the “MARCHE ON” position.
- Operate the pump button (31) until petrol is flowing into the transparent fuel hose.
- Put the choke lever (32) into the closed position (if the engine is warm or in case of warm weather, choose the half-way or open position).
- Pull the starter cord (33) powerfully and put it back to its initial position (several times, if necessary).
- As soon as the engine has been started, move the choke lever (32) slowly to the open position.
- If the engine is cold, warm it up for about 2 minutes.
- While drilling, let the engine always run with full load. Depress the accelerator (34) completely for this purpose.
- Release the accelerator after drilling.
- Change the ignition switch (30) to the “OFF” position to stop the engine.

TO 8.1 Starting the engine of drilling machine SBM-V

Figure 11

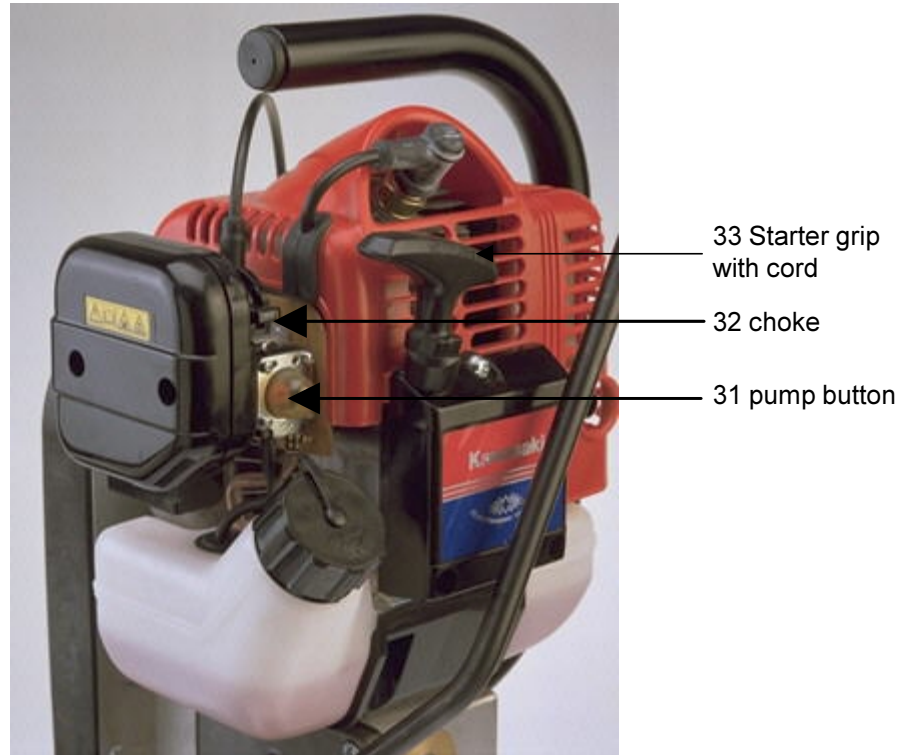
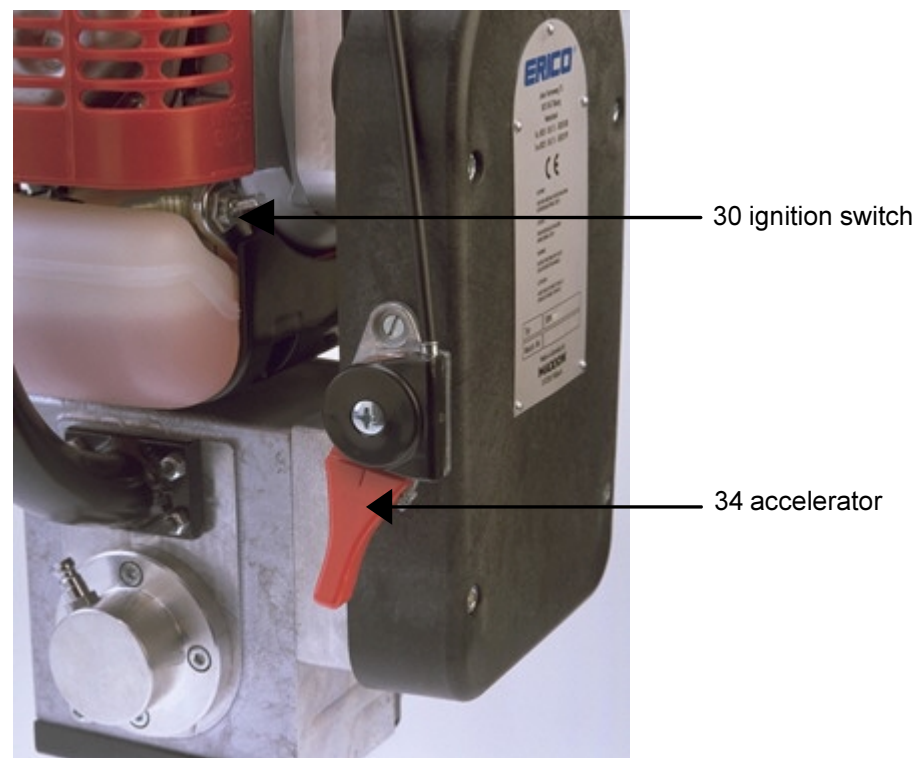


Figure 12



8.2 Starting the battery operated drilling machine SBM-E/48V

- ⇒ Connect the drilling machine to the battery pack with the power cable (34)
- ⇒ Press the start button on the drilling machine (32)
- ⇒ After the drilling switch off the drilling machine by pressing the stop button (33)
- ⇒ **Attention!** Running electro-motors can cause sparks. Flammable or explosive materials could catch fire.

8.2.1 When the machine does not start

- ⇒ Check whether the battery pack is charged
- ⇒ Check whether the fuse in the battery pack is in tact.
- ⇒ To do this, open the battery pack, open the fuse box, check the fuse and replace if necessary.
(Spare fuse 50 A ERICO-Art. No. 716069)

Figure 13

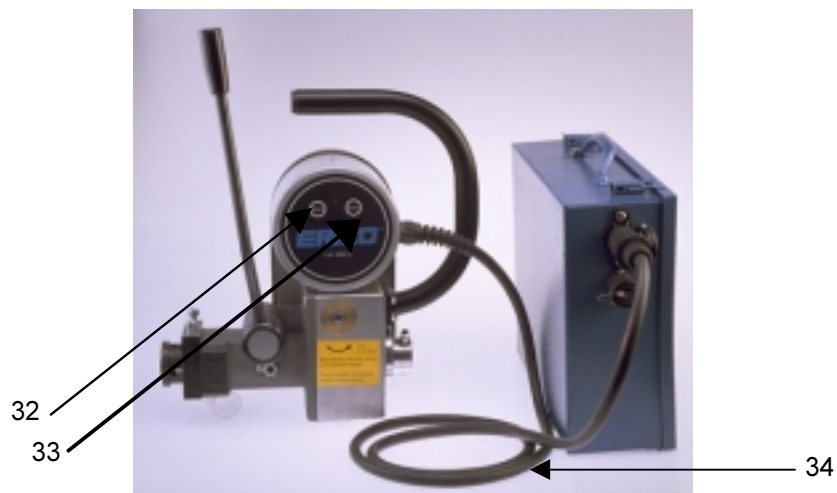


Figure 14

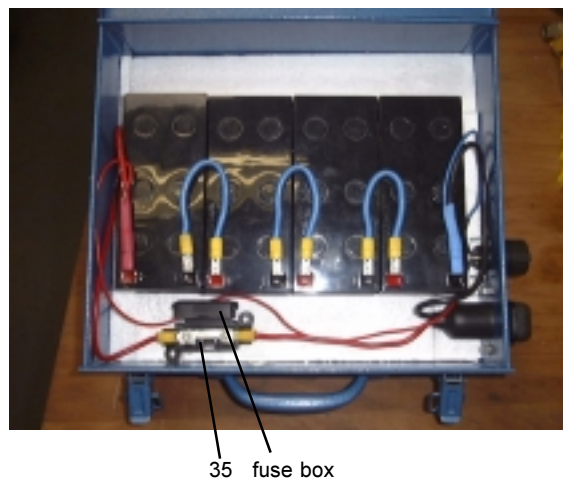


Figure 15



8.2.2 Charging the battery pack

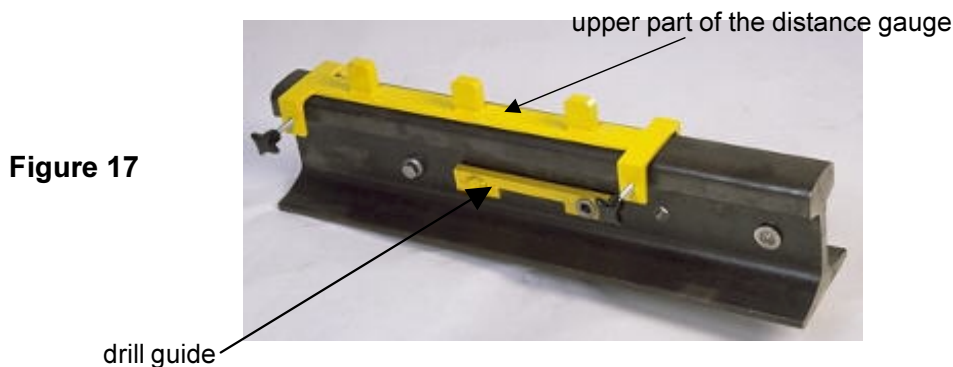
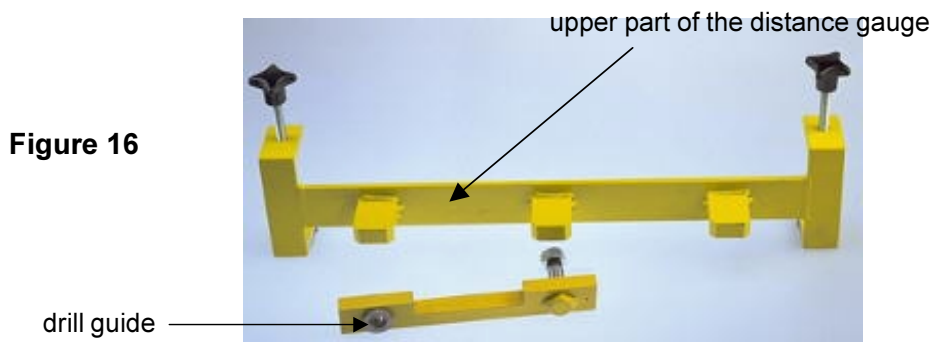
- Connect the battery pack to the charging device with the plug (30)
- **Attention!** The net voltage has to be the same as the voltage indicated on the charging device.
- Start the charging device with switch (31). The green LED should light up.
- Charge the battery pack until the LED "full" lights up. (Charging time approx. 10 hrs).

9.1 Drilling with distance gauges

9.1.1 Distance Gauge with Drill Guide and profile template with special drill heights for drilling mounting holes for axle counters (wheel sensors)

The distance gauge equipped with drill guide is needed for making drill hole spacings if increased precision is required (e.g. for wheel sensors, axle counters).

- Inserting a rail drill Type SSB13 (E. No. 716320) with mounting adapter ASP13 (E. No. 715180) and coolant adapter ZSP (E. No. 715520) into the drilling spindle
- The upper part of the gauge is clamped onto the rail head by tightening both clamping screws by hand.
- Shift clamping arm BSK1 or BSK2 which is attached to the drilling machine over the most left hand parallel pin of the three parallel pins available and clamp the drilling machine to the rail with the correct profile template.
- Drill the first hole with $\varnothing = 13 \text{ mm}^*$.
- Introduce the drill guide into the first hole and loosely tighten with the M-12 nut.
- Hang up the drilling unit loosely over the second centring block and adjust the drill guide (38) in height, so that the drill will fit exactly into the drill bush (39).
- Tighten the drill guide in this position and drill the second hole.



9.1.2 Distance Gauge without Drill Guide

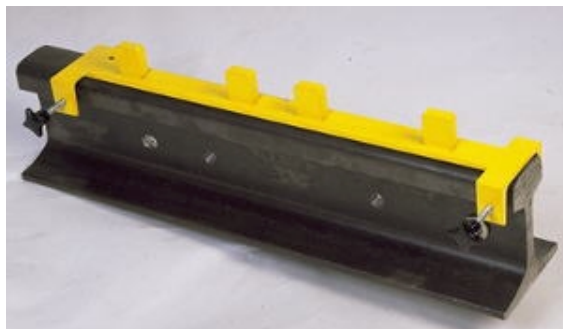
Distance gauges without drill guide are used as auxiliary devices for making drill hole spacings with a somewhat better precision of $\pm 1\text{mm}$, e.g. in case of fishplates or insulated rail joints.

Procedure:

- Mount the required rail drill (\varnothing to choice)
- Mount the correct profile template and the correct clamping arm to the drilling machine.
- Clamp the distance gauge on the rail head. (the middle position of the respective parallel pins is equivalent to the later positions of the required drill holes).
- Place the drilling machine over the parallel pins by means of the clamping arm and clamp the drilling unit to the rails
- Using this procedure drill all required holes. The gauge remains clamped to the rails until all holes have been drilled!!

Item	Designation	Art. No.
1	Upper part distance gauge for SEL (148mm)	716528
2	Upper part distance gauge for insulated rail joint MT (165-140-165)	715266
3	Upper part distance gauge for insulated rail joint MT (165-96-165)	715267
4	Upper part distance gauge for Tiefenbach (145mm)	716535
5	Upper part distance gauge for Siemens (270mm)	716532
6	Upper part distance gauge for special dimensions	on request

Figure 18



9.1.3 Allocation of special profile templates with special drilling heights for the respective distance gauges with drill guide for axle counters or wheel sensors by Siemens, SEL and Tiefenbach/Frauscher

In general drill holes are needed with a diameter of 13mm for these sensors. Therefore rail drill SSB13 (ERICO-No. 716320) is used with mounting adapter ASP13 (ERICO-No. 715180) and coolant adapter ZSP (ERICO-No. 715520).

Axle counter (wheel sensor)	Distance gauge ERICO Art. No.	Rail type	Drill height	template type	ERICO Art No.
Siemens with	Distance gauge	S49	62.5mm	S49 / 62.5	715510
a pitch	Complete (270mm)	S54	67.5mm	S54 / 67.5	715538
of 270 mm	E.No. 716527	UIC 60	85.5mm	UIC 60 / 85.5	715537
Tiefenbach/	Distance gauge	S49	62.5mm	S49 / 62.5	715510
Frauscher with	Complete (145mm)	S54	67.5mm	S54 / 67.5	715538
a pitch	E.No. 716534	UIC 60	85.5mm	UIC 60 / 85.5	715537
of 145 mm					
SEL with a	Distance gauge	S49	64mm	S49 / 64	715511
pitch	Complete (148mm)	S54	67.5mm	S54 / 67.5	715538
of 148 mm	E.No. 716526	UIC 60	74mm	UIC 60 / 74	715536

9.1.4 Other profile templates and distance gauges

We will be pleased to offer you profile templates for other types of rail with for instance special drill heights and /or distance gauges for different sensors.

10 Storage

- Detach the coolant receptacle from the machine.
- Store the coolant receptacle always unpressurised.
- Clean the drilling unit, fastening device and accessories.
- Move the spindle completely back.
- Protect the whole system against humidity and dust during the storage.
- Move the sleeve several times and finally bring it to the backmost position in order to remove residual coolant from the machine.

Prior to long-time storage!:

(only applies to drilling machines with petrol engines)

- Empty the petrol tank completely!
- Let the engine run until it will stop automatically to empty also the carburettor completely.
- Unscrew the spark plug and pour 3 - 5 cm³ of oil into the cylinder.
- Pull the starter cord several times to distribute the oil in the cylinder.
- Clean all metal parts of the drilling unit with an oily rag.
- Screw in the cap of the tank and the spark plug again.

11 Maintenance

11.1 Maintenance of Gear

At the latest after the first 20 working hours, and then regularly after approx. every 100 working hours.:

- Put the machine in a horizontal position.
- Open the oil filling and drain screw (48 / Pos. 7).
- Check the oil level. (Oil level just below the oil filling opening is recommended.)
- Total gear oil contents: 60 ml
- Top up oil if oil level is too low.
- Use only oil of SAE 75-W90 viscosity.
- Change oil completely if it is dirty.

Every 50 working hours, at least 1x per month:

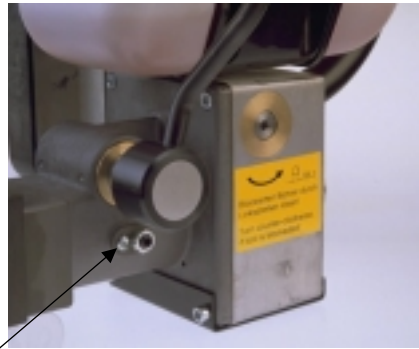
- Check all screws and nuts for tight fit.
- Move the sleeve to the backmost position and grease the front spindle bearing
- through the lubricating nipple (42) with roller bearing grease. (Grease gun included in accessories)

Figure 19



41

Figure 20



42

11.2 Maintenance of Combustion Engine

Cleaning of filter

- Remove cap of petrol tank.
- Pull out mixture filter.
- Clean filter sponge with petrol and insert it again.

Cleaning of air filter

- Remove screws.
- Detach filter.
- Clean filter and filter case with petrol.
- Insert filter again and fasten filter case.

11.3 If the engine does not start

- Switch the ignition switch off.
- Pull the spark plug socket off, unscrew the spark plug.
- Pull the starter cord several times powerfully to eliminate excess fuel from the cylinder.
- Dry the spark plug and screw it in again.
- Put the spark plug socket on, change the ignition switch over to "MARCHE ON".
- Turn the choke lever to the open position and start the engine.

12 Spare Parts

Within the scope of proper use of the machine the customer is only allowed to change the drilling tools and clamping arms.

13 Putting out of Action / Disposal

Even in the case of high-quality appliances, the question for their disposal will at some point arise.

The individual components of the aggregate have to be disposed of separately. First, the oil has to be drained and taken to a special waste disposal facility.

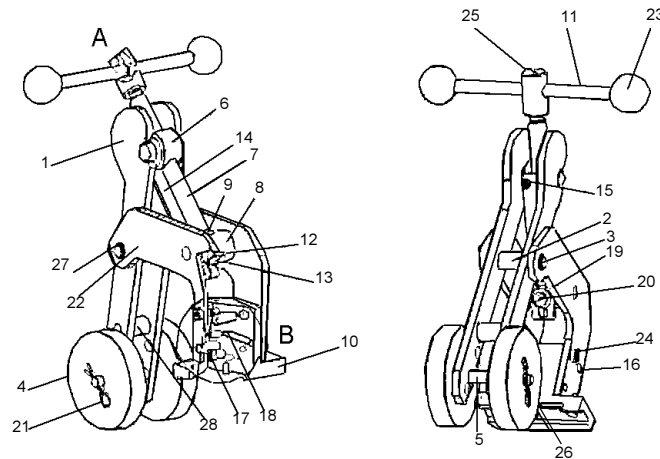
Attention! Gear oils are a danger to the groundwater. Uncontrolled draining or inappropriate disposal is punishable offences.



The other parts of the aggregate have to be disposed of according to the environmental standards as now are or hereafter may be in force.

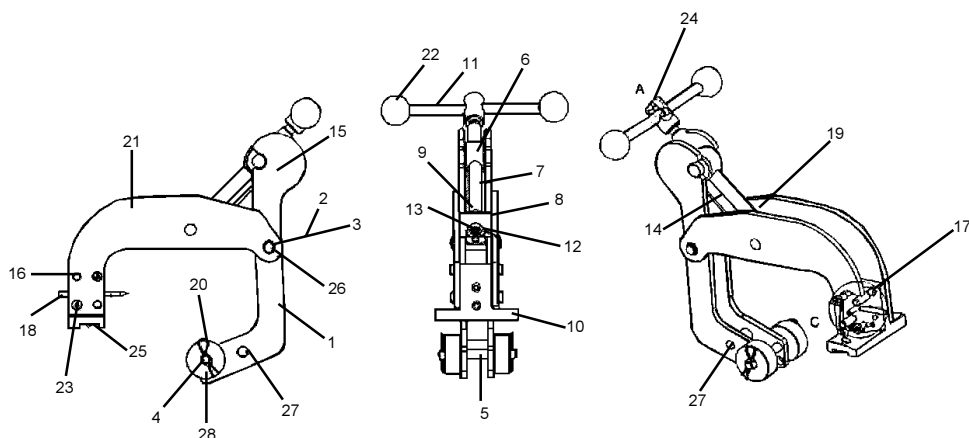
To avoid possible environmental pollution, we recommend having them disposed by authorised professional companies. It cannot be promised that the manufacturer will take the old appliance back free of charge.

14 Drawing spare part BSK1



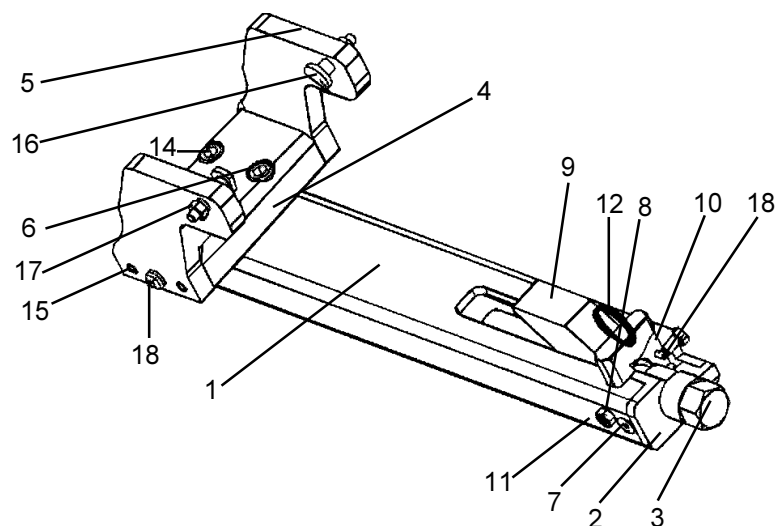
Item	Pieces	Designation	Art. No.
1	2	Arm for BSK 1	716035
2	1	Bush	716040
3	1	Bolt, long	716045
4	2	Wheel, big	716050
5	1	Axle	716060
6	1	Trapezoidal nut	716065
7	1	Spindle	716070
8	1	Bearing block	716075
9	1	Washer 8.5x14x3	716080
10	1	Flange	716085
11	1	Lever	716090
12	1	Washer	716095
13	1	Cheese head screw	716092
14	1	Guiding plate	716105
15	2	Tallow-drop screw	716073
16	4	Parallel pin	716205
17	4	Spring mounted set screw	716120
18	1	Parallel pin	716125
19	1	Countersunk screw	716130
20	1	Washer	716135
21	2	Split-pin	716140
22	2	Crooked arm BSK 1	716145
23	2	Spherical button	716150
24	4	Oval head screw	715835
25	1	Set screw	716160
26	1	Parallel pin	716165
27	2	Locking ring	716170
28	1	Bolt, short	716175

15 Drawing spare parts BSK 2 (Art. No. 715370)



Item	Pieces	Designation	Art. No.
1	2	Clamping arm for BSK 2	716106
2	1	Bush	716040
3	1	Bolt, long \varnothing 10x53	716045
4	2	Wheel, small	716055
5	1	Axle	716060
6	1	Trapezoidal nut	716065
7	1	Spindle	716070
8	1	Bearing block	716075
9	1	Washer 8.5x14x3	716080
10	1	Flange	716085
11	1	Lever	716090
12	1	Washer	716095
13	1	Cheese head screw M5x10	716100
14	1	Guiding plate	716105
15	2	Tallow-drop screw	716110
16	4	Parallel pin	716205
17	2	Spring mounted set screw	716120
18	1	Parallel pin	716125
19	1	Countersunk screw	716130
20	2	Split-pin	716140
21	2	Crooked arm BSK 2	716210
22	2	Spherical button	716150
23	4	Oval head screw	715835
24	1	Set screw	716160
25	1	Parallel pin	716165
26	2	Locking ring	716170
27	1	Bolt, short	716175
28	2	Wheel, large	716050

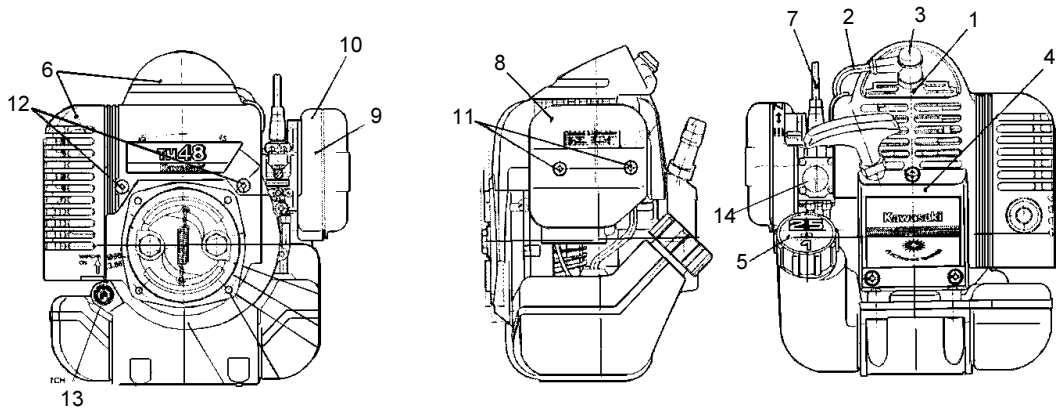
16 Drawing spare parts BSF 1



Item	Pieces	Designation	Art. No.
1	1	Longitudinal bearer	715715
2	1	End plate with drill hole	715790
3	1	Spindle	715705
4	1	Cross plate	715795
5	2	Side plate	715800
6	4	Cheese head screw	715845
7	2	Countersunk screw	715435
8	2	Spring mounted set screw	715440
9	1	Clamping piece	715710
10	1	Sliding plate	715720
11	2	Hexagon nut	715875
12	1	Key ring	715815
13	1	Dowel pin	715450
14	1	End plate	715725
15	4	Centring pin	715840
16	2	Collar screw	715615
17	2	Hexagon nut	715615
18	1	Oval head screw	715835

17 Spare parts for SBM-V

17.1 Spare parts for SBM-V with combustion engine



Item	Pieces	Designation	Art. No.
1	1	Spark plug	715980
2	1	Spark plug cable	715975
3	1	spark plug socket	715970
4	1	Starter complete	716030
5	1	Cap of petrol tank, complete	716025
6	1	Engine cover	715965
7	1	Split-pin	715990
8	1	Cover air filter	715985
9	1	Seat of air filter	716005
10	1	Casing of air filter	716010
11	2	Air filter cover screw	716015
12	2	Cross-recessed head screw	716020
13	1	On/off switch	on request
14	1	Suction membrane	on request

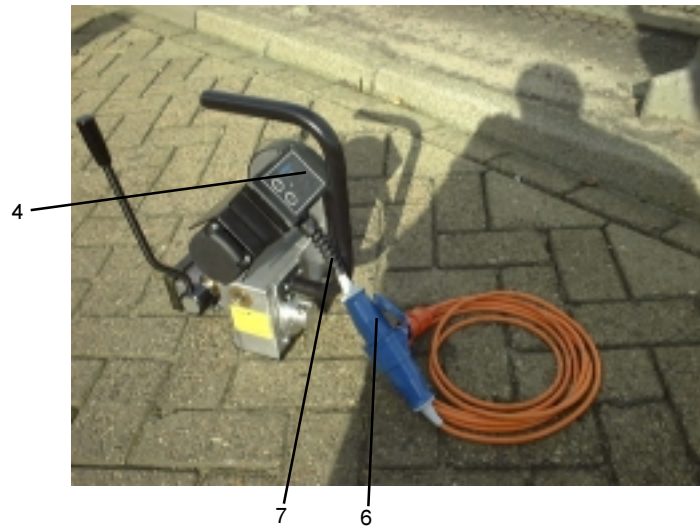
17.2 Spare parts for drive SBM-E/48 Volt DC



Item	Pieces	Designation	Art. No.
1	1	*Cover complete with current limiter	715361
2	1	*Connector cable	715755
3	1	battery pack	715357
4	1	charging device	715425
5	1	Fuse 50 A	716069
6	1	Oval head screw	716067
7	1	*Cable-end protection	715805
8	1	*Three-pole socket	716068
9	1	*Three-pole plug	715785
10	1	Control panel foil	716062

* These parts can only be changed by trained personnel that have received their training from ERICO. We recommend absolutely having defects to the machine regarding the drive repaired by ERICO.

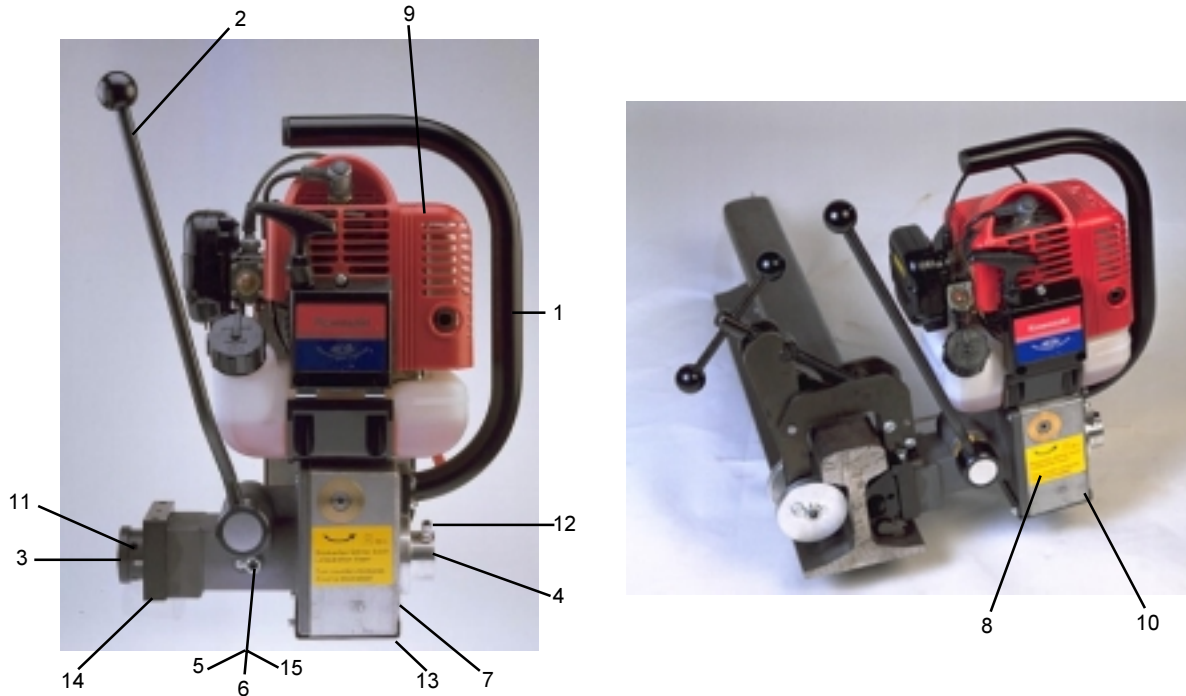
17.3 Spare parts for drive SBM-E/230 Volt AC



Item	Pieces	Designation	Art. No.
1	1	Drive engine 230 Volt AC	715407
2	1	Protective cover	715336
3	1	Start/Stop electronics	715337
4	1	Control panel foil	716059
5	1	Safety extension cable (5m)	715338
6	1	Connector-plug with connection cable	715891
7	1	Pull-protection with cable-end protection	715339

18 Spare parts for SBM drill units

18.1 Spare parts for drill unit SBM-V

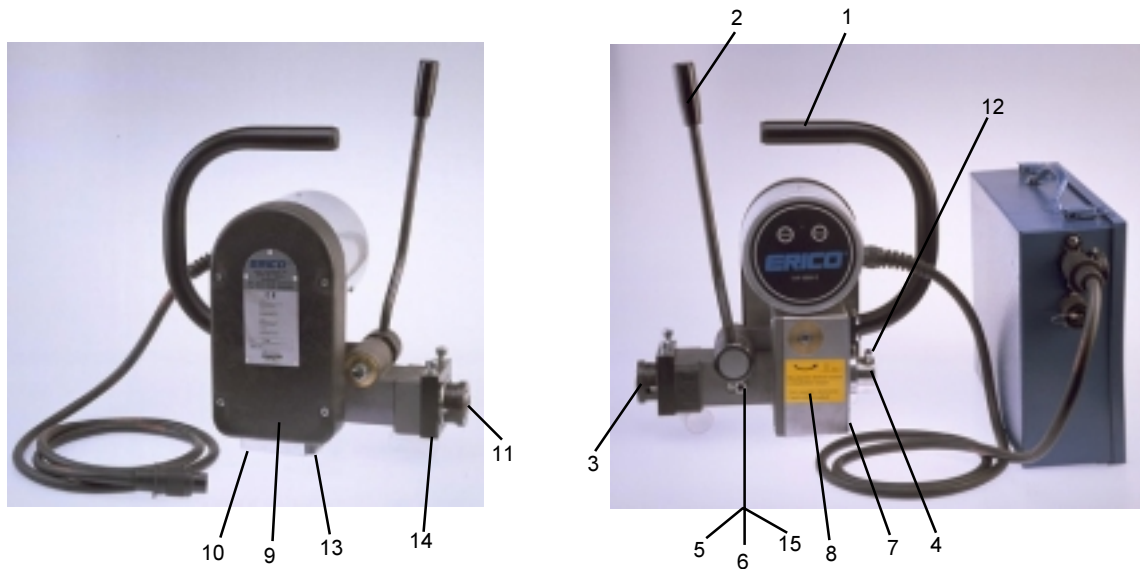


Item	Pieces	Designation	Art. No.
1	1	Grip for SBM-V	715436
2	1	Feed lever	715916
3	1	Oscillating disc	716091
4	1	Mount complete	715955
5	1	Screw M8 flat	715925
6	1	Set screw M8x20	715920
7	1	Oil control cap	715915
8	1	Sticker "Drill blocked"	715486
9	1	Cover plate	715434
10	1	Gear oil 70 ml	716326
11	2	Set screw M10x8	715745
12	1	Connector plug KSGA 18.5,2	715781
13	1	Ground cover plate	715432
14	1	Mount	715431
15	1	Washer	715930

ERICO offers its clients a comprehensive spare parts and repair service. In practice however we have found that it is not very useful to offer our clients all separate parts as spare parts. The technical complexity of the machine construction requires damage to the inside of the machine to be repaired in the ERICO service-centre in Tilburg/ The Netherlands. In case of repairs please send the machine to:

ERICO B.V.
 Jules Verneweg 75
 5015 BG Tilburg
 The Netherlands

18.2 Spare parts for drill unit SBM-E 48 V

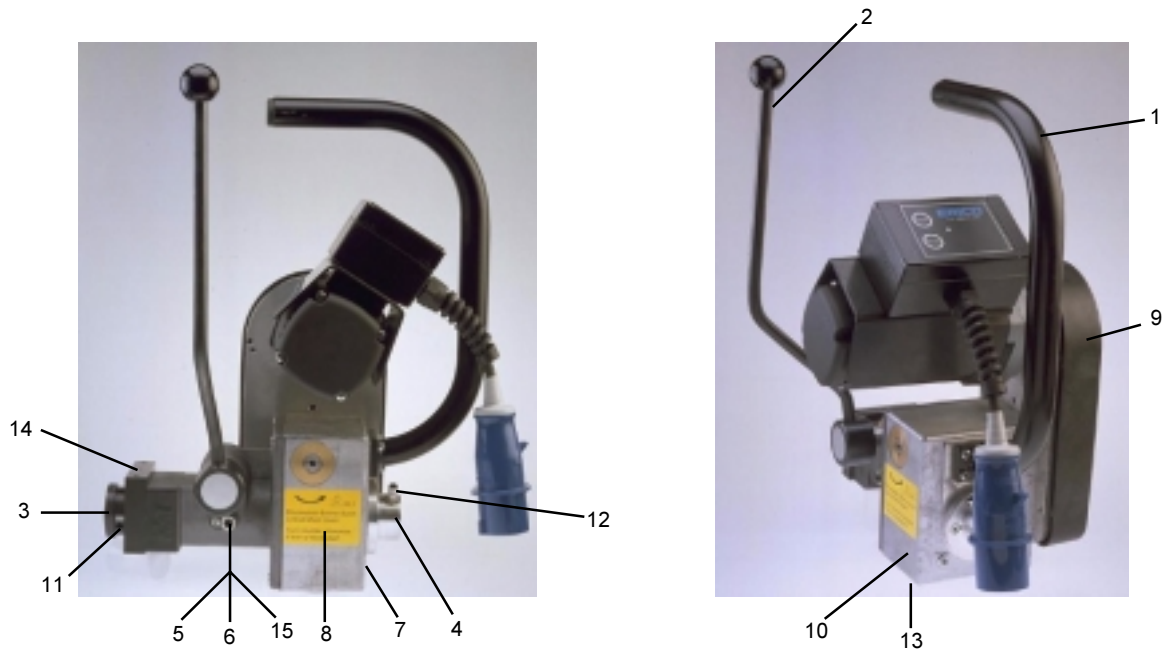


Item	Pieces	Designation	Art. No.
1	1	Grip for SBM-E	715429
2	1	Feed lever	716089
3	1	Oscillating disc	716091
4	1	Mount complete	715955
5	1	Screw M8 flat	715925
6	1	Set screw M8x20	715920
7	1	Oil control cap	715915
8	1	Sticker "Drill blocked"	715486
9	1	Cover plate	715434
10	1	Gear oil 70 ml	716326
11	2	Set screw M10x8	715745
12	1	Connector plug KSGA 18.5,2	715781
13	1	Ground cover plate	715432
14	1	Mount	715431
15	1	Washer	715930

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ERICO B.V.
 Jules Verneweg 75
 5015 BG Tilburg
 The Netherlands

18.3 Spare parts for drill unit SBM-E 230V



Item	Pieces	Designation	Art. No.
1	1	Grip for SBM-E	715429
2	1	Feed lever	715916
3	1	Oscillating disc	716091
4	1	Mount complete	715955
5	1	Screw M8 flat	715925
6	1	Set screw M8x20	715920
7	1	Oil control cap	715915
8	1	Sticker "Drill blocked"	715486
9	1	Cover plate	715434
10	1	Gear oil 70 ml	716326
11	2	Set screw M10x8	715745
12	1	Connector plug KSGA 18.5,2	715781
13	1	Ground cover plate	715432
14	1	Mount	715431
15	1	Washer	715930

ERICO offers its clients a comprehensive spare parts and repair service. In practice however we have found that it is not very useful to offer our clients all separate parts as spare parts. The technical complexity of the machine construction requires damage to the inside of the machine to be repaired in the ERICO service-centre in Tilburg/ The Netherlands. In case of repairs please send the machine to:

ERICO B.V.
 Jules Verneweg 75
 5015 BG Tilburg
 The Netherlands

19 Warranty

Dear customer,

Your decision in favour of this tool has been a decision in favour of high quality.

For your safety, your new Rail Drilling Machine SBM-V has been subjected to various tests realised by **ERICO**

Please, **always** read the Operating Instructions prior to using the tool to avoid improper handling and application.

For further information, our Technical Service in Tilburg will be pleased to be at your disposal.

Warranty

Serial No.: _____

This machine has been checked for perfect operation. Provided its proper use, we grant a **warranty of 18 months**.

Quality assurance: _____

Date: _____