Elektro-Thermit GmbH & Co. KG, A GOLDSCHMIDT COMPANY, Chemiestr. 24, 06132 Halle/Saale, Germany

Responsible Welding Coordinator of the trainees
according EN ISO 14731

Information for the Responsible Welding Coordinator of the trainees concerning needed preparations to perform training courses

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1. Basics to training courses / examinations for the users of products and THERMIT® welding procedures of Elektro – Thermit GmbH & Co. KG

THERMIT® welding is to be classified as a safety-critical activity. All operators shall have passed a training course approved by Elektro-Thermit GmbH & Co. KG and be in possession of a Diploma in Aluminothermic Welding of Rails for the relevant THERMIT® welding procedure.

Any initial training differs according to the status of the trainee's pre-qualification in THERMIT® - welding

either as a

„initial training to a THERMIT® welding procedure with lack of existing certificate for a successfully passed initial training to another aluminothermic welding procedure"

or as a

„upgrade to a THERMIT® welding procedure which is based on a existing proof for a successfully passed initial training to another aluminothermic welding procedure" .

An upgrade to a THERMIT® welding procedure is subject to the employee having already received a certificate for having passed a training course in another aluminothermic welding procedure successfully. In this case we can adjust the training period to suit the individual conditions.

Training period:
Minimum of 10 - 15 working days, for upgrades minimum of 1 - 3 working days.
IRJ 1 - 2 working days

Training time:

Day of arrival	by arrangement
Other days	8 a.m. – 6 p.m.
Day of departure	by arrangement

The limit of numbers of trainees per course is one trainer for max 6 trainees.
A maximum of three trainees will practice with one set of equipment.

Equipment required by each trainee:

- Welder's protective clothing (trousers and jacket with long sleeves)
- Welder's goggles (for welding and flame cutting)
- Ear protectors
- Protective gloves
- Safety boots
- Gas lighter
- Oil pastels
- Crown measuring wedge
- Watch with a seconds indicator
- Feeler gauge 0.1 – 1.0 mm
- Temperature indicator 400 °C
- Recommended: leather spats for flame cutting of rails

We would like to point out that you are to delegate your trainees to attend training programs in due possession of comprehensive Personal Protective Equipment (PPE), and that your trainees are to have received instructions from you in accordance with the stipulations of the accident insurance provider (insofar as shall be pertinent and/or in subsistence) and of legislature (in Germany, in accordance with §12 of the Occupational Health and Safety Act [ArbSchG] and A1 [Accident-Prevention Regulation: Principles of Prevention] of the Regulation on Safety and Health at Work [BGV]).

As a possible basis for instruction and for selection of the PPE, we are providing you with the appended risk assessment statement issued by Elektro-Thermit GmbH & Co. KG (Limited Partnership). However, this is not to replace your own activity- and working environment-related risk assessment.

Our trainer is equipped by us only with the personal protective equipment (PPE) against the hazards of the relevant training process.
If moreover further PPE becomes necessary because of other hazards such as against head injuries, against danger of falling, against dangers arising from rail traffic or similar, then kindly make such equipment at your expense available for our trainer and ensure under your response for his instruction proof.

We assume that the participants have obtained accident insurance policies that cover their activities. No liability is assumed by Elektro-Thermit GmbH & Co. KG (Limited Partnership) beyond the extent stipulated by law.

Furthermore we assume no whatsoever liability for welds performed during the training, neither for quality nor for correct execution, particularly if they, upon your request, were executed in tracks of railway operators.

We thus kindly ask you to equip your trainees accordingly and to understand that our trainer is enjoined to verify compliance with the specified requirements in detail before the training course starts and to allow your trainees only then to take part in the training.

Please find enclosed the code of practice for the respective welding procedure on which the training course is based.

We create, sign and send the results / evidence of the courses exclusively in digital form.
We charge you with lump sums for trainings and for paper-printed of results / evidence of the courses. Ask the sales department.

Please send us a confirmation as soon as possible, at the latest however before the training course starts, stating that the following requirements are all met in detail:

- All trainees are provided with complete equipment.
- Please ensure for all training languages except English and German an uninterrupted interpreter deployment at your expense.
- In the event that an upgrade is planned, the certificate stating that the respective trainee already passed a training course concerning another aluminothermic welding procedure successfully has been presented to Elektro-Thermit GmbH & Co. KG before the start of the training course.

We would like to bring to your attention that Elektro-Thermit GmbH & Co. KG will invoice you any costs due to additional expenditure which may result from non-compliance with the specified requirements with regard to the time and content-related implementation of the training course. This also applies to incorrect or incomplete details in your confirmation or if we do not receive any confirmation at all.

2. Specialities if implemented externally on the premises of the customer

Material requirements for implementation of the training course:
Please note with regard to the welding equipment to be provided by your company that the training course will only be performed on the autogenous equipment (pressure reducer, flashback arrestors, pressure drop shut-off devices, etc.) that is specified in the code of practice. The use of other equipment (other brands) not mentioned in this document is not permitted for the training course and examination.

You have to provide consumables including rails and equipment for each of the trainees for at least

- 8 welds, standard gap, suspended and supported joint
- 1 weld, L50
- 1 weld, L75
- 1 weld, THR

We implement the training course on your company premises or on your tracks. Please ensure that the local conditions also allow the trainees to practice the following necessary training options for:

vignol rails, grooved rails

- New / new joints (identical profile, identical rail head height)
- New / worn joints (identical profile, different rail head height)
- Transition joints (different profiles)
- Welding on curved tracks
- Welding on superelevated tracks
- Welding with long-life crucible system
- Welding with single-use crucible system
- Gap widths of 50 and 75 mm
- 3-part moulds
- Welding supported joints on point frogs

crane rails

- Welding only by using the single use crucible system and standard gap.
- Joints to be welded have to be aligned at both sides on a minimal length of rail of 10m if the training is in situ
  and
  of 1,5m if the training is in workshop.
  A clear height under rail feet of minimal 80mm has to be.

IRJ

Both rails shall be fixed and tightened. Both end-faces of the rails shall be set under pressurization to each other.

Please send us a confirmation as soon as possible, at the latest however before our trainer leaves for the training course, stating that the following requirements with regard to the time and content-related implementation of the training course are all met in detail on site for the planned training venue.

- All training options mentioned can be carried out.
- All consumables are available in sufficient quantity and their quality is in accordance with
  the code of practice.
- The equipment is available in sufficient quantity and its quality is in accordance with the code of practice.
- A projector in a room for training course is available.

In this connection we expressly point out again that, except for the rails, your trainees have to bring along all of their required devices, tools and consumables completely and without exception on their own.

Except for the rails, there will not be any possibility to borrow devices and consumables or to mutually invoice the withdrawal of consumables from the store of the host company between the trainees from different companies. We thus kindly ask you to equip your trainees accordingly and to understand that our trainer is enjoined to verify compliance with the specified requirements in detail before the training course starts and to allow your trainees only then to take part in the training.

Attachements

Code of Practice for the respective welding procedure on which the training course is based risk assessment statement issued by Elektro-Thermit GmbH & Co. KG

Activity/Hazard: **Performing THERMIT® welds on rails during internal and external training courses**

Break-down:

No.	Process/operation	Activity to be performed by staff	Equipment	Hazardous substances	Specifics

Sequence of operations	What may happen? (hazards) Risks for persons and the environment	Preventive measures and rules of conduct How can accidents be prevented?

No.	Process/operation	Activity to be performed by staff	Equipment	Hazardous substances	Specifics
A1	Loosening the rail fixtures.	The rail fixtures of the rail ends to be welded are loosened using one of the pieces of suitable equipment listed. The rail fixtures to the right and left of the welding joint are dismantled.	Coach-screwing machine, impact screw driver, hand wrench, generator.	Fuel.	Noise hazard. Risk of injuries due to holding the drill/screw chuck (may cause painful bruises in the palm and grazes). Hazard due to electrical energy.
A2	Making the welding gap: moving the rails.	The rail fasteners are loosened and the rail is moved.	Long supporting wedge, sledge hammer, crow bar, impact screw driver, coach-screwing machine, generator.	Fuel.	Hazards associated with lifting and carrying heavy objects. Hazard due to electrical energy.
A3	Making the welding gap: abrasive cutting.	A rail is cut through or part of a rail is cut off with the equipment. The abrasive cutting machine is partly guided by hand.	Abrasive cutting machine with abrasive cutting disk and guide arm.	Fuel.	Hazard of hearing impairment due to noise. Risk of injuries due to flying sparks and parts flying off or a burst cut-off wheel. Ignition hazard for combustible materials and due to rotating parts.
A4	Making the welding gap: flame-cutting.	The flame cutting gauge is mounted on the rail to be cut. A rail or part of a rail is flame cut using a flame cutter with	Pressure reducer, flashback arrestor for oxygen, acetylene and / or propane. Hoses for oxygen, acetylene or propane.	Oxygen, propane and / or acetylene.	Hazards due to compressed gas cylinders and their gases. Risk of burns for operators and third parties. Risk of eye injuries (glare,

No.	Process/operation	Activity to be performed by staff	Equipment	Hazardous substances	Specifics
		guidance unit. The rail is heated up to a defined temperature before flame-cutting if necessary.	Handle and cutting attachment with torch guidance unit. Rail flame cutting gauge, hand hammer, wire brush. Long supporting wedges and straight edge 1 m long. Heating torch tip.		flying sparks, weld spatter). Ignition hazard for combustible materials.
A5	Cleaning the surface of the cut produced by abrasive or flame cutting and cleaning the rail ends.	The welding gap is cleaned of slag and steel residues. Both ends of the rail are cleaned of rust, dirt and oil.	Hand hammer, wire brush, flat chisel and file.		Risk of eye injuries due to slag cracking off. Risk of burns from hot surfaces. Risk of cuts from sharp edges.
A6	Aligning the welding joint and removing the intermediate layers.	The ends of the rail are lifted in succession with a crow bar so that the intermediate layers are exposed. The intermediate layers are then removed and replaced by supporting wedges. The ends of the rails are then aligned	Crow bar, long supporting wedge, short supporting wedge, hand hammer, straight edge 1 m long, guard rail tie bars, impact screw driver, generator, coach-screwing machine and crown measuring wedge.	Fuel.	Risk of crushing your fingers when removing the intermediate layers. Risk of eye injuries due to steel particles cracking off from the supporting wedges (burr formation). Hazards associated with lifting heavy objects.

No.	Process/operation	Activity to be performed by staff	Equipment	Hazardous substances	Specifics
		relative to each other with the supporting wedges.			
A7	Fitting the clamping device.	The setting gauge is brought into position and the clamping device fixed to the rail.	Setting gauge and clamping device.		Risk of crushing your fingers.
A8	Fitting the torch saddle with the pre-heating torch tip inserted, and aligning the pre-heating torch.	The torch saddle is placed onto the torch stand pipe of the clamping device with the pre-heating torch tip inserted, adjusted to a defined distance to the running surface of the rail with the setting gauge and fixed with the fixing screw. The torch is then adjusted to the middle of the welding gap and perpendicular to all rail axes.	Torch saddle, setting gauge, pre-heating torch tip, clamping device.		Risk of burns (hot pre-heating torch from previous drying of the LLC).
A9	Fitting the welding moulds.	The welding moulds are adjusted to the welding joint by chafing at the rails or rasping the mould	Clamping device, mould shoes, rasp, welding moulds and card blank.		Risk of crushing your fingers. Risk of grazes or stabs (due to a loose or no rasp handle).

No.	Process/operation	Activity to be performed by staff	Equipment	Hazardous substances	Specifics
		material. The two mould halves are then inserted into the mould shoes and fixed individually relative to each other at the joint gap with the mould tensioning arms. Before the second mould half is fitted, the welding gap is covered with a card blank.			
A10	Sealing the welding moulds and fitting the slag pans.	A groove provided at the welding moulds is filled with luting paste and the paste firmly pressed in with the fingers. Or the sealing strip on the mould shoes are filled with luting sand. The luting sand is then compacted with a stamping device before the slag pans are attached to the mould shoes. The slag overflow strips are covered with luting paste or luting sand in both cases.	Luting sand, paste, spatula, stamping devices.		Risk of dry skin of the hands due to luting paste and luting sand. Risk of crushing injuries and grazes wounds to your fingers. Risk of burns from the hot slag pans.

No.	Process/operation	Activity to be performed by staff	Equipment	Hazardous substances	Specifics
A11	Drying the long-life crucible (LLC).	The LLC is dried by using a torch.	Complete LLC, pressure reducer, flashback arrestor for oxygen, acetylene and / or propane. Hoses for oxygen, acetylene or propane. Handle with pre-heating torch tip.	Oxygen, propane and / or acetylene.	Hazards due to compressed gas cylinders and their gases. Risk of burns for operators and third parties. Ignition hazard for combustible materials.
A12	Removing old thimble residues, inserting the tapping thimble and fitting the LLC. Removing the inner slag ring (cleaning the LLC). Placing the LLC with crucible tripod onto the pipe socket of the clamping device.	If the LLC has already been used, slag and thimble residues are removed from the seat of the tapping thimble and the inner slag ring if necessary using the tapping thimble extractor. The thimble opening is then reclosed with a thimble. The tapping thimble is taken from the packaging sleeve and inserted into the seat of the tapping thimble using the applicator. The closing sand from the packaging sleeve is then spread around the	Clamping device, applicator, tapping thimble extractor, crucible tripod, complete long-life crucible. Hammer		Risk of burns and hazards associated with lifting heavy objects. Risk of eye injuries from slag cracking off.

No.	Process/operation	Activity to be performed by staff	Equipment	Hazardous substances	Specifics
		tapping thimble. The LLC is now placed together with the crucible tripod onto the pipe socket of the clamping device and aligned above the welding mould.			
A13	Filling the portion into the LLC or single-use crucible.	The portion bag is opened and the portion filled into the respective crucible by hand.	Complete LLC, single-use crucible and portion. Suitable sharp edge.		Hazards associated with lifting heavy objects. Risk of cuts and grazes when opening the bag.
A14	Drying the slag pans and pre-heating.	The slag pans are dried with a torch. The ends of the rails are pre-heated to a defined temperature using the torch. The pre-heating torch which is connected to the torch saddle is ignited and fixed on the torch stand pipe of the clamping device for this purpose.	Pressure reducer, flashback arrestor for oxygen, acetylene and / or propane. Hoses for oxygen, acetylene or propane. Handle with pre-heating torch tip, torch saddle and slag pans. Gas lighter.	Oxygen, propane and / or acetylene.	Hazards due to compressed gas cylinders and their gases. Risk of burns for operators and third parties. Risk of eye injuries from luting sand particles flying off. Ignition hazard for combustible materials.

No.	Process/operation	Activity to be performed by staff	Equipment	Hazardous substances	Specifics
A15	Inserting the plug piece and swivelling the LLC into position.	After pre-heating has been completed and the pre-heating torch removed, the plug is inserted into its seat using tongs and pressed firmly into position. The crucible tripod with the LLC is then swivelled into position until the outlet is centred over the plug.	LLC including the portion in the crucible tripod. Plug piece and fire tongs.		Risk of burns for users and third parties. Ignition hazard for combustible materials.
A16	Inserting the plug piece and bringing the single-use crucible into position.	After pre-heating has been completed and the pre-heating torch removed, the plug is inserted into its seat using tongs and pressed firmly into position. The respective single-use crucible is inserted in the guide and centred on the mould shoes.	Single-use crucible including the portion. Plug piece and fire tongs.		Hazards associated with lifting heavy objects. Risk of burns for users and third parties. Ignition hazard for combustible materials.

No.	Process/operation	Activity to be performed by staff	Equipment	Hazardous substances	Specifics
A17	Igniting the Thermit portion and Thermit reaction process.	The igniter is ignited at the flame of the pre-heating torch and plugged into the portion.	Thermit portion in the LLC or single-use crucible and igniter. Pressure reducer, flashback arrestor for oxygen, acetylene and / or propane. Hoses for oxygen, acetylene and / or propane. Handle with pre-heating torch tip and torch saddle.	Oxygen, propane and / or acetylene and igniter.	Hazards due to compressed gas cylinders and their gases. Risk of burns for operators and third parties. Risk of eye injuries (due to flying glowing particles), health hazard for the respiratory tract due to smoke produced during the reaction. Ignition hazard for combustible materials. Hazard due to the LLC swivelling out during reaction on superelevated tracks.
A18	Inflow of the Thermit steel.	The reaction and inflow of the steel are monitored.	LLC or single-use crucible.	Liquid steel and liquid slag.	Risk of eye injuries from liquid Thermit steel (glare). Risk of injuries from accidental escape of steel (incorrect sealing with luting sand or luting paste). Explosion hazard due to the formation of oxyhydrogen gas when the hot slag comes into contact with a moist medium.
A19	Removing the singe-use crucible or LLC, the slag	The now empty LLC is lifted from the clamping device with its crucible tripod and put down. The	Lifting fork for single-use crucible, 750 mm long crow bar or narrow stamper and hand	Hot slag or liquid steel.	Risk of burns from hot equipment and extremely hot slag. Risk of eye injuries from mould parts, sand residues or slag that may

No.	Process/operation	Activity to be performed by staff	Equipment	Hazardous substances	Specifics
	pans, mould shoes and clamping device.	respective single-use crucible is lifted from the mould shoes using the lifting fork and put down. The slag pans full of slag are then removed from the mould shoes. The clamping device is then loosened and removed from the rail before the mould shoes are carefully removed from the welding moulds.	hammer. Single-use crucible or LLC with crucible tripod, slag pans, mould shoes and clamping device.		crack off. Explosion hazard due to the formation of oxyhydrogen gas when the hot slag/steel comes into contact with a moist medium. Risk of injuries when the slag pans are removed and the slag is not yet solidified.
A20	Turning over and removing the mould head.	A pre-determined breaking line is worked in around the mould head with a saw blade. The mould head is then carefully turned over with a hand hammer and removed from the welding point with a ballast fork.	Hand hammer, saw blade and ballast fork.	Hot slag and steel.	Risk of burns from hot or still molten steel, mould, sand and slag residues as well as hot surfaces. Explosion hazard due to the formation of oxyhydrogen gas when the hot residues come into contact with a moist medium. Risk of eye injuries due to mould parts that may crack off or sand residues that may be ejected. Ignition hazard for combustible materials.

No.	Process/operation	Activity to be performed by staff	Equipment	Hazardous substances	Specifics
A21	Trimming the risers on the rail head, rail head side and rail foot (excess weld metal).	A trimming device with fitted shear blades is placed above the excess weld metal. After a visual inspection of the excess weld metal, the parts of the trimming device are moved together with a drive unit or a hand pump drive. The excess weld metal is thereby sheared off.	Hydraulic trimming device with shear blades and drive unit or hand pump drive. Hydraulic hoses and hand hammer.	Fuel and hydraulic oil.	Tripping hazard due to hydraulic hoses. Risk of burns from extremely hot risers on the rail head and rail foot (excess weld metal). Risk of injuries from sand or welding mould residues or oxide skin that may crack off. Crushing hazard, even severing of fingers. Hazards associated with lifting heavy objects.
A22	Manual removal of the risers from the rail head and rail head side (excess weld metal) with an electric chisel hammer.	The excess weld metal is removed with a hand-held chisel hammer and a clamped armoured flat chisel starting at the riser on the rail head.	Electric chisel hammer, armoured flat chisel and generator.	Fuel.	Risk of burns from hot excess welding metal. Risk of eye injuries due to slag, sand or welding mould residues that may crack off. Hazard of hearing impairment due to noise. Risk of injuries from the hot scrap chisel slipping off from the weld metal.
A23	Manual removal of risers from the rail head and rail head side (excess weld metal) with a hot scrap	The risers are removed from the rail head side with a hot scrap chisel and sledge hammer. The riser is then removed from the	Hot scrap chisel with an arm and sledge hammer. Pressure reducer, flashback arrestor for oxygen, acetylene and / or	Oxygen, propane and / or acetylene.	Risk of burns from hot excess welding metal. Risk of eye injuries due to slag, sand or welding mould residues that may crack off. Hazard of hearing impairment due to noise.

No.	Process/operation	Activity to be performed by staff	Equipment	Hazardous substances	Specifics
	chisel and sledge hammer.	riser of the rail head with an autogenous cutting attachment.	propane. Hoses for oxygen, acetylene or propane. Handle with flame cutting attachment.		Risk of injuries from the hot scrap chisel slipping off from the weld metal or the sledge hammer slipping of from the chisel. Hazard of flying sparks during autogenous cutting.
A24	Removing the sheared-off riser residues (excess weld metal).	The sheared-off riser residues are knocked off the rail head and removed from the welding point with a sand collecting plate.	Sand collecting plate and hand hammer.		Risk of burns from hot media and surfaces. Risk of eye injuries from sand or welding mould residues that may crack off or slag particles that may be ejected. Ignition hazard for combustible materials.
A25	Grinding the rail head in readiness for service (coarse grinding)	The excess material is ground off with a machining allowance relative to the rail surface using the listed equipment.	Grinding device with right-angle grinder (SV-W) and cup wheel. Rail head grinding machine with grindstone Right-angle grinder with roughing disk and generator.	Fuel.	Risk of eye injuries from flying sparks, particles flying off or a burst grinding wheel. Health hazard for the respiratory tract when handling the right-angle grinder (wheel swarf). Noise hazard when using the grinding equipment. Hazards associated with lifting heavy objects. Ignition hazard for combustible materials.

No.	Process/operation	Activity to be performed by staff	Equipment	Hazardous substances	Specifics
					Hazard due to electrical energy.
A26	Removing the supporting wedges, cleaning the weld, inserting the intermediate layers and mounting the rail fixtures.	The weld is slightly raised with a crow bar or rail lifting jack. The supporting wedges are removed and the intermediate layers inserted. The weld is then lowered and the rail fasteners are mounted and tightened before the risers are knocked off the rail foot. Sand and mould residues as well as casting residues are removed with a chisel and hammer.	Hand hammer, chisel, crow bar, rail lifting jack, impact screw driver, coach-screwing machine, sand collecting plate, generator.	Fuel.	Risk of eye injuries from sand or mould residues that may crack off and metal residues that may fly off (flash formation). Risk of crushing the fingers when inserting the intermediate layers. Hazard due to electrical energy.
A27	Fine grinding and marking the weld.	The weld is reprofiled to the defined tolerance and then marked.	Grinding device with right-angle grinder (SV-W) and cup wheel. Rail head grinding machine with grindstone. Right-angle grinder with roughing disk and	Fuel.	Risk of eye injuries from flying sparks, particles flying off or a burst grinding wheel. Health hazard for the respiratory tract when handling the right-angle grinder (wheel swarf). Noise hazard when using the grinding

No.	Process/operation	Activity to be performed by staff	Equipment	Hazardous substances	Specifics
			generator. Measuring gauge and straight edge, 1m lang.		equipment. Hazards associated with lifting heavy objects. Ignition hazard for combustible materials. Hazard due to electrical energy.

<table>
<tr><th>Sequence of operations</th><th>What may happen? (hazards)

Risks for persons and the environment</th><th>Preventive measures and rules of conduct

How can accidents be prevented?</th></tr>
<tr><td rowspan="3">Handling of heavy objects

Applies to operations:

1,2,3,6,12,13,16,19,21,22, 23,25,26,27</td><td>Accidents due to obstructed traffic routes.</td><td>Keep the traffic routes clear.

Provide intermediate storage areas.</td></tr>
<tr><td>Foot injuries due to heavy objects falling down.</td><td>Wear S3 safety shoes.</td></tr>
<tr><td>Diseases of the spinal column due to lifting and carrying heavy objects.

Injuries due to exposure to excessive loads during lifting and carrying.</td><td>Use transportation and lifting aids.

Make sure that the workplaces have an ergonomic design.

Instruct the staff involved in correct lifting and carrying.

Observe the load limits.

<table>
<tr><td rowspan="2">Age

in years</td><td colspan="4">Frequency of lifting and carrying</td></tr>
<tr><td colspan="2">Occasionally</td><td colspan="2">Frequently</td></tr>
<tr><td></td><td>Women</td><td>Men</td><td>Women</td><td>Men</td></tr>
<tr><td>15 - 18</td><td>15 kg</td><td>35 kg</td><td>10 kg</td><td>20 kg</td></tr>
<tr><td>19 - 45</td><td>15 kg</td><td>55 kg</td><td>10 kg</td><td>30 kg</td></tr>
<tr><td>As of 45</td><td>15 kg</td><td>45 kg</td><td>10 kg</td><td>25 kg</td></tr>
</table>
Limit values
Recommended limit values</td></tr>
</table>

Sequence of operations	What may happen? (hazards) Risks for persons and the environment	Preventive measures and rules of conduct How can accidents be prevented?
Handling electrical equipment, general information Applies to operations: 1,2,6,21,22,25,26,27	Electric shock or fire hazard due to defective electrical hand tools or power leads.	Annual check by an qualified electrician. Devices that are used outdoors, must be connected via an earth-leakage circuit breaker.
	Injuries due to unprotected machine parts.	Check whether the electrical hand tool is protected and the protection is effective.
	Eye injuries due to flying sparks and parts flying off.	Wear safety goggles.
	Hazard of hearing impairment due to noise.	Prevent noise as far as possible by technical measures. Provide suitable ear protectors as of 80 dB(A) and make sure that these are really used as of 85 dB(A). Provide G 20 hearing screening.
	Foot injuries due to heavy objects falling down.	Wear S3 safety shoes.
	Entanglement of clothes or hair by a drilling spindle, drill or spinning workpiece.	Wear tight-fitting clothes. Cover your hair. Do not use gloves when working with spinning workpieces if there is an entanglement hazard.

Sequence of operations	What may happen? (hazards) Risks for persons and the environment	Preventive measures and rules of conduct How can accidents be prevented?
	Hearing impairment.	Provide suitable ear protectors as of 80 dB(A) and make sure that these are really used as of 85 dB(A). Provide G 20 hearing screening.
	Exposure to harmful hand-arm vibration.	Use low-vibration machines; change your activity at regular intervals.
Handling the right-angle grinder Applies to operations: 25,27	Hazard of hearing impairment due to noise.	Prevent noise as far as possible by technical measures. Provide suitable ear protectors as of 80 dB(A) and make sure that these are really used as of 85 dB(A). Provide G 20 hearing screening.
	Risk of injuries from flying sparks and parts flying off or a burst cut-off wheel.	Adjust the protective hoods of the right-angle grinder correctly. Use the grinding wheels for their intended purpose (do not use the cut-off wheel for grinding). Provide safety goggles and make sure that they are used. Wear safety shoes, only put the machine down after the wheel has come to a standstill, pay attention to the expiry date of the cut-off wheel.

Sequence of operations	What may happen? (hazards) Risks for persons and the environment	Preventive measures and rules of conduct How can accidents be prevented?
	Kickback of the right-angle grinder.	Hold the right-angle grinder tight. Install the grinder so that any forces that occur suddenly can be absorbed.
	Falling down of heaving objects.	Wear S3 safety shoes.
	Ignition of combustible materials.	Wear clothes that are not easily combustible. Remove combustible material from the working area.
	Hazard for third parties.	Persons who are in the danger zone must wear the personal protective equipment listed above under "General information".
	Parts flying off.	Wear safety goggles.
Handling the electrical chisel hammer	The tool may slip off the workpiece.	Hold the tool tight with both hands and make sure that you have a firm footing.

Sequence of operations	What may happen? (hazards) Risks for persons and the environment	Preventive measures and rules of conduct How can accidents be prevented?
Applies to operation: 22	Risk of burns from hot excess welding metal. Risk of eye injuries due to slag, sand or welding mould residues that may crack off.	Wear the personal protective equipment listed above under "General information".
	Harmful dusts.	Wear a respirator.
	Exposure to harmful hand-arm vibration.	Use low-vibration devices. Change the workplaces regularly.
	Hazard of hearing impairment due to noise.	Prevent noise as far as possible by technical measures. Provide suitable ear protectors as of 80 dB(A) and make sure that these are really used as of 85 dB(A). Provide G 20 hearing screening.
Handling the grinding device SV-W (right-angle grinder guided by a frame) Applies to operations: 25,27	Hazard of hearing impairment due to noise. Risk of injuries due to flying sparks and parts flying off or a burst cut-off wheel. Kickback of the right-angle grinder, falling down of heavy objects, ignition of combustible materials and hazard for third parties.	Only use the Bosch right-angle grinder GWS 26-180. Only use conical cup wheels with the dimensions 110/90 x 50 x 22.2 for a permissible peripheral speed of 50 m/s which have been approved by the Deutscher Schleifscheiben-Ausschuss DSA (German Grinding Wheel Association) as a grinding wheel. Only use balanced grinding wheels that do not display any cracks, fissures or other damage. Before installation check every grinding wheel for cracks, tear-out, etc. by a visual inspection and an acoustic test. Subject newly clamped

Sequence of operations	What may happen? (hazards) Risks for persons and the environment	Preventive measures and rules of conduct How can accidents be prevented?
		grinding wheels to a test run under no-load conditions for 5 minutes. Do not remove the protective enclosure of the grinding wheel while the grinding device is in operation. Switch off the right-angle grinder when lifting and moving the grinding device. Wear safety goggles and ear protectors during grinding.
Handling the abrasive cutting machine (guide arm) Applies to operation: 3	Hazard of hearing impairment due to noise.	Prevent noise as far as possible by technical measures. Provide suitable ear protectors as of 80 dB(A) and make sure that these are really used as of 85 dB(A). Provide G 20 hearing screening.
	Risk of injuries from flying sparks and parts flying off or a burst cut-off wheel.	Adjust the protective hoods of the right-angle grinder correctly. Use the grinding wheels for their intended purpose (do not use the cut-off wheel for grinding). Provide safety goggles and make sure that they are used. Wear safety shoes. Pay attention to the expiry date of the cut-off wheel.
	Kickback of the abrasive cutting machine after changing the grinding wheel and inserting it back into the cutting gap if cutting is not yet complete.	Clamp the abrasive cutting machine tightly, hold the machine tight and make sure that you have a firm footing. Carefully insert the rotating cut-off wheel back into the cutting gap.

Sequence of operations	What may happen? (hazards) Risks for persons and the environment	Preventive measures and rules of conduct How can accidents be prevented?
	Falling down of heaving objects.	Wear S3 safety shoes.
	Ignition of combustible materials.	Wear clothes that are not easily combustible. Remove combustible material from the working area.
	Hazard for third parties.	Persons who are in the danger zone must wear the personal protective equipment listed above under "General information".
Handling the rail grinding machine to reprofile the rail head Applies to operations: 25,27	Parts flying off.	Wear safety goggles and safety shoes.
	Tripping and falling hazard, especially falling into the working area.	Assume a safe work position. Avoid working in unbalanced conditions.
	Hazard for third parties.	Persons who are in the danger zone must wear the personal protective equipment listed above under "General information".
	Ignition of combustible materials.	Wear clothes that are not easily combustible. Remove combustible material from the working area.

Sequence of operations	What may happen? (hazards) Risks for persons and the environment	Preventive measures and rules of conduct How can accidents be prevented?
	Fuel ignition hazard (petrol).	Do not refuel or start the machine above the welding joint.
	Jerks and impacts when the spindle is moved towards the rail unintentionally when holding the device (e.g. the straight edge has just been put into place and the running grinding machine is held by somebody else standing next to the rail).	Make sure that you have a firm footing and hold the grinding machine tight.
	Hazard from moving machine parts when moving the machine to the neighbouring rail or the other side of the rail head during operation.	During ongoing operation: only move the machine together with another person. When you are alone: only move the machine when this is switched off.
Handling the hydraulic pump (electrical, manual, combustion engine) for trimming device Applies to operation: 21	Uncontrolled escape of the pressure medium (e.g. due to driving over the hoses with a rail vehicle), unintentional machine movements (feed pressure is 500 bar).	Regular visual inspection of the hose lines and their connections. Engage the couplings completely and correctly. Do not change the pressure limiter at the drive and only use approved quality hoses with a nominal pressure of 700 bar. Do not lay the hoses across the tracks.
	Tripping hazard.	Walk around any hoses and do not step over any hoses.

Sequence of operations	What may happen? (hazards) Risks for persons and the environment	Preventive measures and rules of conduct How can accidents be prevented?
Handling the combustion engine for: - **generator** - **abrasive cutting machine, impact screw driver** - **hydraulic pump** - **rail grinding machine** - **coach-screwing machine** Applies to operations: 1,2,3,4,21,22,25,26,27	Hazards associated with fuel.	Observe the operating instructions for petrol. Work on the fuel tank or with the fuel itself may only be performed outside closed rooms or in very well ventilated rooms. Do not perform such work in the range of flying sparks or near hot welding joints. Close the fuel tank tightly after filling with fuel and check that no fuel escapes. Always open the cover of the fuel tank slowly so that potential excess pressure may escape without fuel spattering. This is especially important at high ambient temperatures. Do not fill the fuel tank fully when refuelling a very hot machine. The fuel tank may only be refilled to approx. ¾ of its capacity. It is forbidden to open containers containing easily and / or highly flammable substances near ignition sources, i.e. especially near naked flames during cutting and welding work. Observe a safety gap of 3 m to ignition sources in all directions and another 7 m up to 0.5 m above the ground. When opening a can, the outlet should not point towards an ignition source or towards other persons.

Sequence of operations	What may happen? (hazards) Risks for persons and the environment	Preventive measures and rules of conduct How can accidents be prevented?
		Prevent a sudden pressure drop in fuel cans by opening the cover slowly. When refuelling a sheet-metal can, this must be upright and may only be filled up to below the filler neck at most. This is ensured by inserting the nozzle into the filler neck which then switches off the pumping operation automatically by the counter-pressure of the rising liquid. It is forbidden to use plastic fuel tanks and cans on building sites since there is a risk of flying sparks and placing the plastic fuel can or tank on or beside hot slag, hot steel or hot welding residues.
	Hot surfaces.	Do not touch hot surfaces.
	Hazard of hearing impairment due to noise.	Prevent noise as far as possible by technical measures. Provide suitable ear protectors as of 80 dB(A) and make sure that these are really used as of 85 dB(A). Provide G 20 hearing screening.
	Health hazard due to noise.	Prevent noise as far as possible by technical measures. Provide suitable ear protectors as of 80 dB(A) and make sure

Sequence of operations	What may happen? (hazards) Risks for persons and the environment	Preventive measures and rules of conduct How can accidents be prevented?
Handling the impact screw driver Applies to operations: 1,2,6,26		that these are really used as of 85 dB(A). Provide G 20 hearing screening.
	Risk of injuries due to holding the drill/screw chuck (may cause painful bruises in the palm and grazes).	Do not touch the screw chuck when screwing. Switch the motor off before changing the screw chuck.
	Kickback of the impact screw driver if this is defective.	Hold the impact screw driver tight. Make sure that you have a firm footing. Do not continue to use the device after identifying a defect.
Handling the coach-screwing machine (for rail fasteners with an electric motor) Applies to operations: 1,2,6,26	Tripping when lifting and putting down the machine on the rail; letting the machine fall; tipping over of the machine if the lateral support is not used.	Firm footing; install and remove the machine, attach and remove the lateral support only in a group of three persons, do not use the machine without the lateral support.
	Risk of injuries due to holding the drill/screw chuck (may cause painful bruises in the palm and grazes). Slipping off (stab, scratch, graze and impact injuries are typical consequences).	Do not touch the screw chuck when screwing. Switch the motor off before changing the screw chuck. Hold the coach-screwing machine tight and make sure that you have a firm footing.
	Ejection of workpieces or tools or pieces thereof.	Adjust the torque correctly. Wear safety boots.
	Entanglement hazard for loose clothes and long hair.	Wear a hair net, helmet or cap. Wear tight-fitting clothes.

Sequence of operations	What may happen? (hazards) Risks for persons and the environment	Preventive measures and rules of conduct How can accidents be prevented?
Handling the trimming device Applies to operation: 21	Risk of hand injuries when changing the shear blades if the hydraulic drive is connected.	Switch the hydraulic drive off when changing the shear blades.
	Risk of hand injuries due to the shear movement.	Do not raise the trimming device while moving it to and fro (only raise the unit when the 4/3-way valve is in the 0 position and the piston is in the "open" limit position). Only carry the unit by the handle. Do not reach into the potential movement range of the piston. Do not reach into the shear movement range.
	Risk of burns from red-glowing steel (material sheared off).	Wear protective clothes, safety shoes and heat-resistant gloves.
	Risk of eye injuries from sand or welding mould residues that may crack off or slag particles that may be ejected.	Wear safety goggles.
	Uncontrolled escape of the pressure medium.	Couple the hose lines safely and do not lay them across the rails.

Sequence of operations	What may happen? (hazards) Risks for persons and the environment	Preventive measures and rules of conduct How can accidents be prevented?
Handling pre-heating, heating and after-heating torches, straightening torches, cutting torches and gouging torch (oxygen, propane, acetylene) Applies to operations: 4,8,11,14,17,23	Development of fires due to flying sparks or slag dripping down.	Remove combustible objects. Cover combustible objects which cannot be removed. Wear flame-resistant clothes which are not soaked with oil.
	Gas cylinder fire due to flashback.	Make use of the back-pressure valve at each gas connection point and have it checked at least once a year.
	Foot injuries due to heavy objects falling down.	Wear S3 safety shoes.
	Risk of eye injuries (glare, weld spatter).	Wear safety goggles with a filter no. 6.
	Hearing impairment.	Provide suitable ear protectors as of 80 dB(A) and make sure that these are really used as of 85 dB(A). Provide G 20 hearing screening.
	Hazards due to improper handling of compressed gas cylinders.	Place the compressed gas cylinders in a safe position. Keep the oxygen fittings and compressed gas cylinders free from oil and grease. Close the valves and protective caps during transport.

Sequence of operations	What may happen? (hazards) Risks for persons and the environment	Preventive measures and rules of conduct How can accidents be prevented?
	Risk of burns from naked flames or hot device parts (operator and / or third parties).	Only use suitable gas lighters. Do not point the ignited torch towards yourself or other persons.
Handling the igniter Applies to operation: 17	Ignition hazard for packaging or portions and clothes.	Store the igniters separately and do not carry them in your clothes on your body.
Igniting the Thermit portion and inflow of the steel Applies to operations: 17,18	Risk of eye injuries from glare or red-glowing parts flying off.	Wear safety goggles with a filter no. 6.
	Clothing fire hazard.	Wear flame-resistant clothes.
	Health hazard for the respiratory tract due to smoke development.	Pay attention to the wind direction. Use a filter attachment in halls or tunnels.
	Risk of burns from accidental escape of steel.	Keep a safe distance.
	Risk of crushing your fingers when removing the intermediate layers and placing the supporting wedges in position.	Do not reach in between the rail and ribbed sole plate or sleeper. Slightly remove the ballast to the right and left.

Sequence of operations	What may happen? (hazards) Risks for persons and the environment	Preventive measures and rules of conduct How can accidents be prevented?
Handling the supporting wedges and flat chisel Applies to operations: 2,4,5,6,26	Risk of injuries due to steel parts cracking off.	Remove the burr that may form on the supporting wedges or flat chisel.
	Risk of eye injuries due to slag cracking off when cleaning the flame-cut area with a flat chisel.	Wear safety goggles.
Handling the hot scrap chisel and sledge hammer Applies to operation: 23	Risk of burns from hot excess welding metal. Risk of eye injuries due to slag, sand or welding mould residues that may crack off.	Wear safety gloves and safety goggles when guiding the hot scrap chisel. Wear flame-resistant clothes.
	Risk of injuries due to the hot scrap chisel slipping off from the weld metal or the sledge hammer slipping off from the chisel.	Make sure that you have a firm footing. Do not wear gloves when using the sledge hammer. No persons may be in the impact direction of the sledge hammer.
	Hazard of hearing impairment due to noise.	Provide suitable ear protectors as of 80 dB(A) and make sure that these are really used as of 85 dB(A). Provide G 20 hearing screening.
Handling luting sand or luting paste	Risk of skin damage (drying-out of the skin).	Use a suitable hand cream and wear rubber gloves.

Sequence of operations	What may happen? (hazards) Risks for persons and the environment	Preventive measures and rules of conduct How can accidents be prevented?
Applies to operation: 10		
Inserting the plug piece Applies to operations: 15,16	Risk of burns.	Wear gloves. Insert the plug piece with fire tongs.
Handling extremely hot welding residues Applies to operations: 20,21,22,23,24	Risk of burns.	Wear gloves. Always use a lifting fork or crow bar to remove the single-use crucible. Wear gloves when turning over the mould head and use a ballast fork to put the mould head down.
	Ignition hazard for combustible materials.	Always place welding residues on non-combustible surfaces or into suitable containers.
	Risk of injuries when the slag pans are removed and the slag has not yet solidified.	Wait until the slag has solidified before removing the slag pans.

Sequence of operations	What may happen? (hazards) Risks for persons and the environment	Preventive measures and rules of conduct How can accidents be prevented?
	Risk of eye injuries from mould parts, sand residues or slag that may crack off.	Wear safety goggles.
	Explosion hazard when a hot medium comes into contact with a moist medium.	Only place welding residues on dry surfaces.
Handling hazardous substances Applies to operations: 1,2,3,4,6,11,14,17,18,19, 20,21,22,23,25,26,27	Hazards due to hazardous substances.	Observe the operating instructions.