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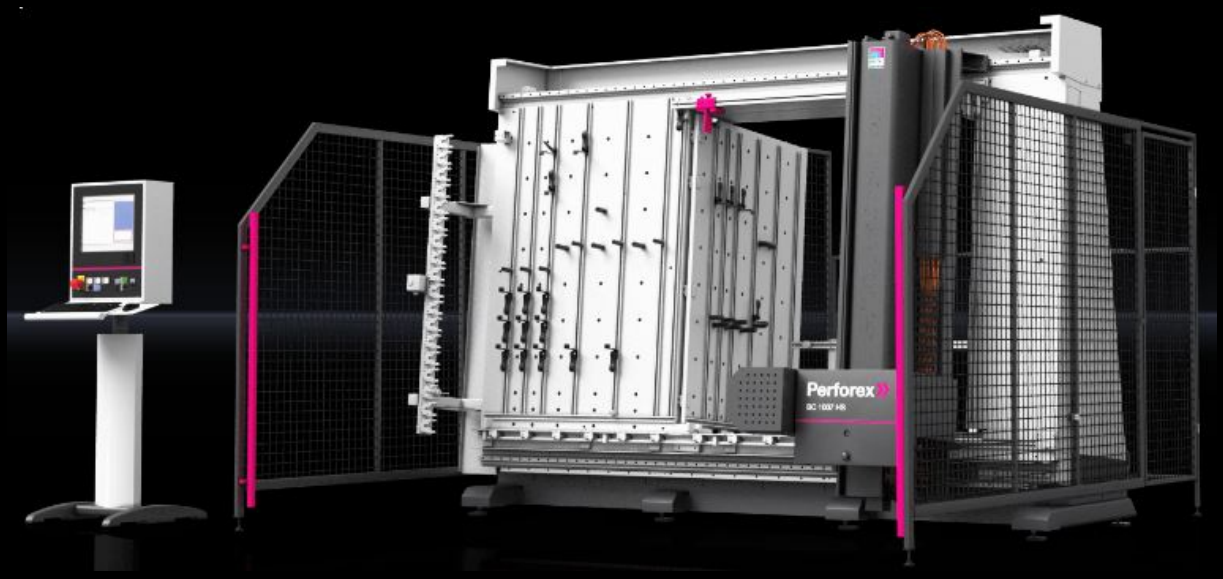
Operating manual

Perforex>> BC 1007 HS

Machine no. 58 1xx



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State of most recent edition can be obtained through the manufacturer.

The indicated data only serve as product description. The indications do not release the user from own judgements and tests. One has to be aware, that our products are naturally subject to wear and tear and aging process.
The front page shows a sample configuration. The delivered product may though differ from the picture.

In case a competitor is trying to have a view of this operating manual, we do expect from you the same fairness which you normally expect from your customers in such cases.

Under reserve of technical modifications.

Project	Machining centre Perforex BC 1007 HS
Author(s)	Kiesling Maschinentechnik GmbH
Status	
Version	1.2
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Revision survey

Date	Version	Remarks / Reason for modification	Author(s)
2011-05-09	1.1	Diverse modifications updated	bo

Reference

Version / Date	Title
	Operating manual Kiesling Maschinentechnik GmbH

Contents

1 General information

1.1 Preliminary remarks

This documentation is addressed to the machine operators.

This operating manual contains important information in order to allow the secure and proper installation of the machining centre Perforex BC 1007-HS, to safely transport it, to start operating it, to make proper use of it, to maintain it and to easily eliminate simple interferences.

In case the operating staff is not sufficiently familiar with the machining centre, we suggest that you ask for the assistance of a Rittal employee in order to give you assistance in assembly of the units well as start up and training of staff on the machine.

Repairs have to be done by specialists and within short time!

Please do read this operating manual carefully – especially the security advices in chapter 2 – and take care, that all operators of this machine have equally read this operating manual.

Observing the safety instructions is important in view of physical danger for operators and reduces in the same time the risk of improper use of the machine. Watch carefully respect the warning signs on the machine. Replace warning signs immediately in case they have disappeared.

Fa. Rittal GmbH & Co. KG declines any liability for damages on the machine caused by disregard of given hints on the machine itself or in the operating manual.

This operating manual can be supplemented by the operator of the machine with instructions based on existing national instructions regarding accident prevention and environmental protection.

Optionally this operating manual can be supplemented with instructions in regard of obligatory supervision and obligation to register for the consideration of operational peculiarities, as for example in regard of organization of work, workflows, personnel assigned.

Please equally observe generally valid, statuary and other binding regulations with regard to european or national legislation and as well the prescriptions in your country in view of accident prevention and environmental protection.

2 Fundamental security guidelines

The machining centre Perforex BC 1007-HS has been designed and manufactured according to the general and approved rules in technology, prescriptions in view of safety at work, accident prevention and the EU-guideline for safety of machines for intended use. Nevertheless danger exists for physical injuries and material damage, if you do not respect the following basic security advices and warnings in respect of given instructions in this operating manual.

- Please read this operating manual thoroughly and completely, before starting to work with the machining centre Perforex BC 1007-HS.
- Deposit this manual in a way that it is immediately available whenever needed by the operator.
- Always pass on the machining centre Perforex BC 1007-HS to third parties together with this operating manual.
- During jobs like set up, start up, equipping, operating, modifying operating conditions and operating modes, maintenance, all written procedures, described in this manual, for deactivating the machining centre must be respected.

2.1 Determined use

The machining centre Perforex BC 1007-HS serves exclusively for drilling, tapping and milling sections in control cabinet panels and enclosures or cubicles.
Since this machining centre only ensures a restrictive sphere for the user in view of perhaps breaking tools, only monolithic based tools may be employed.
The determined use equally includes the observance of the terms noticed in this operating manual as well as the respectation of the inspection and maintenance conditions.

2.2 None determined use

A none determined use is for example the utilization of the machining centre Perforex BC 1007-HS otherwise than described in chapter 2.1 before.

For damages occurring on the machining centre through none determined use, Fa. Rittal GmbH & Co. KG will not assume any responsibility whatsoever. The risks through none determined use are exclusively at users responsibility.

2.3 Reasonably foreseeable misuse

A reasonably foreseeable misuse is for example the attempt to use the machining centre for purposes not being noticed in chapter 2.1 of this manual, as for example the machining with other tools than prescribed in this manual

2.4 Residual risks having to be considered

Despite the taken measures in view of integration of security during design, safety precautions and additional protective measures, there still has to be considered a certain residual risk.

Especially the following conditions do afford a certain degree of attention from the user of the machining centre:

- Machining of work pieces, which are not appropriate to destination.
- The machining centre can generally be used by one person.
  In case the machining centre is being used by two persons, then the user standing at the operating desk has a special care duty.
- There is a risk of cuts at the machined edges of the work piece, if the user doesn't wear protective gloves (belong to protective equipment).
- There is a danger of injuries caused by hot work pieces or hot tools.
- The careless access to the front working area might cause shocks through the braking portal.
- Risk of cuts through shavings coming off during the cleaning of the machining centre.

2.5 Qualification of employees

The assembly, start up and operation, dismantling, maintenance (servicing included) as well as waste removal necessitates basic mechanical and electrical knowledge, as well as knowledge of associated technical terms. In order to guarantee security in operation, all these tasks may only be assumed through qualified staff or especially instructed persons under guidance of specialist in this domain.

A specialist is somebody, which is able to assess the tasks assigned to, to recognize possible dangers and thus undertake the necessary precautions due to his qualified education, knowledge and experience and in accordance with the given regulations. A specialist is obliged to respect the subject-specific rules.

2.6 Security guidelines in this manual

This documentation shows security guidelines before an action sequence, which carries danger for physical injuries or material damages. The described measures to avert risks must be observed.

The security guidelines are being built up as follows:

SIGNALWORD

Kind and source of danger

Consequences in case of none-observance

- Measures to avert risk
- <enumeration>

- **Warning sign:** attracts your attention for upcoming danger
- **Signal word:** indicates the gravity of danger
- **Kind and source of danger:** designates the kind and source of danger
- **Consequences:** describes the consequences in case of none-observance
- **Defence:** indicates how to avoid upcoming danger

Warning sign, signalword	Signification
DANGER	Characterizes a **dangerous situation**, in which death or heavy corporal injury might occur, if not avoided
WARNING	Characterizes a **dangerous situation,** in which death or heavy corporal injury might occur, if not avoided
CAUTION	Characterizes a **dangerous situation,** in which light or medium corporal injuries might occur, if not avoided
DIRECTIVE	Characterizes **material damages**: the product or the surrounding could be harmed

2.6.1 Symbols

The following symbols characterize directives which are not security-related, yet they do increase the comprehensibility of this documentation.

Symbol	Signification
	If this information is not being considered, the product cannot be used in the most optimal way.
▶	Single, independent process step / instruction
1. 2. 3.	Numbered instruction: the digits indicate, that the process steps are consecutive.

Chart 1: Signification of symbols

2.6.2 Abbreviations

This documentation uses the following abbreviations:

Abbreviation	Signification

Chart 2: Abbreviations

2.7 Product related laws, regulations and prescriptions

2.7.1 Laws, EU-guidelines

- EU – 2006/42/EG – machinery directive
- EU – 2006/95/EG – low-voltage directive
- EU – 2004/108/EG – EMC – guideline

2.7.2 Standards

- DIN EN 292 safety of machinery – basic terms
- DIN EN 294 safety of machinery – safety margins against reaching danger zones
- DIN EN 349 safety of machinery – minimum distances in order to avoid squeezing body parts
- DIN EN 418 safety of machinery – emergency stop equipment
- DIN EN 848-3 safety of milling machines – NC - drilling- and milling machines
- DIN EN 953 safety of machines – separating protective devices
- DIN EN 983 safety of machines – safety-technical requirements pneumatics
- DIN EN ISO 13855 safety of machines – configuration of protective devices
- DIN ISO 7960 noise emission of machine tools
- DIN prEN ISO 13849-1 safety of machines - security related parts of controls
- DIN EN 60204-1 safety of machines – electrical equipment of machines

2.7.3 Accident prevention regulations from professional associations (BGV)

(These are only valid for the german national territory!)

- BGV 1 principles of prevention
- BGV 4 electrical equipment and utilities

2.8 Guarantee regulation

Notified in our general conditions for delivery and payment, to be consulted.

2.9 General safety recommendations

- Valid prescriptions regarding accident prevention and environment protection must be observed.
- Please consider the security prescriptions and safety regulations of the country, in which the machining centre Perforex BC 1007-HS is being applied / employed.
- Only use the machining centre Perforex BC 1007-HS in an impeccable technical state.
- Observe all directives on the machining centre Perforex BC 1007-HS.
- People, which have the allowance to assemble Rittal products, to operate these, to dismantle or to maintain these, may not act under the influence of alcohol, other drugs or medication, which decreases the reaction capability.
- Only use accessories or spare parts admitted by the manufacturer in order to exclude personal danger caused by the use of unsuitable parts.
- Do respect the technical data and ambient conditions noticed in the technical handbook.
- You may only start the machine after having made sure, that the machine does correspond to the country-specific regulations, to their security prescriptions and norms of application.
-

2.9.1 Necessary requirement for the operator of the machine

The operators of this machine must

- be older than 18 years,
- have read this operating manual,
- have had the necessary instructions for operating this machine,
- be fully competent in regard of manipulation and assembly for the necessary procedures,
- be well aware of the valid safety regulations in view of operating this machine and act accordingly (see chapter preliminary remarks),
- be informed about additional local prescriptions (for example safety equipment),
- be aware about possible dangers which could arise in operating such a machine.

2.9.2 Safety examination according to BGV A2 § 5 clause 1 no. 2

The owner has to ensure that the machine will be checked upon its proper condition in a semi-annual rhythm. This examination may only be done by a specialist in electrics or, when using adequate testing equipment through staff, having gained instructions in electrical engineering.

2.10 Machine-specific safety recommendations

2.10.1 During transport

- Please consider the transport instructions on the packaging.
- Always wear a helmet under suspended loads.
- Do not remain standing under heavy loads.
- Consider the directives noticed in chapter 4 „transportation and storage“.

2.10.2 During assembly

- Always assure that the machine is in zero-potential and unpressurized state before assembly of the Perforex BC 1007-HS machining centre or connecting or withdrawing the plug. Secure the machine against reconnection.
- Lay the cables and wires in a way, that they cannot be damaged or that nobody is liable to stumble over them.
- Before start up make sure, that all gaskets and locks of the plug connections have been properly installed and have not been damaged in order to avoid penetration of liquid.
- Consider the directives in chapter 5 „assembly“.

2.10.3 During start up

- Make sure that all power connections are engaged or closed. Only make a start up on a fully installed machine.
- Switch off the network separator (switch for emergency cut-off) before opening the machine and secure against reconnection.
- Consider the directives in chapter 6 „start up“.

2.10.4 During operation

- Only authorized staff may, within the framework of intended use, activate the adjusting devices on the components and component parts of the Perforex BC 1007-HS machining centre.
- Only allow access to the close range of the operational area to persons authorized by the owner. This is also valid during standstill of the equipment.
- Whenever emergency, fault or other appearing irregularities occur, switch off the equipment and protect against reconnection.
- Each security infringed working manner has to be avoided!
- During operation all covers have to be closed.
- Measures are to be taken in order to only employ the machine in a secure and functional state.
- Only employ the machine, when all protective and security devices, as for example separable protective devices or others are available and functional!
- The functionality of the security devices has to be checked according to the maintenance schedule (chapter X „maintenance schedule“)!
- At least once per shift operation, the machine must be checked externally upon recognizable damages or deficiencies.
- Modifications (operating characteristics also) must be instantly reported to the competent authority. If need to be, switch off the machine immediately and secure against reconnection.

2.10.5 During maintenance and repair

- Execute all prescribed maintenance task in the temporal intervals mentioned in chapter 9 „maintenance and repairs“.
- Make sure that no line connections, other connections and component parts are being detached as long as the equipment is under tension.

2.10.6 During waste removal

- Remove waste according to national guide lines.
- Please take notice of chapter 10 „waste removal“ for environmental waste removal.

2.11 Owner obligations

The owner of the Perforex BC 1007-HS machining centre has to organize training of his operating staff on the following themes:

- Observance and application of the operating manual as well as the legal regulations
- Intended operation
- Observance of the instructions given through plant security and the operating manual of the operator.
- Conduct in case of emergency

2.12 Safety equipment

SIGNAL WORD

Malfunction on safety equipment

Danger of malfunctions and operation outside admissible limits

- Safety equipment has to be checked weekly at least upon their functional safety!
- Whenever the safety equipment is out of order, the machine may not be operated.
  Under no circumstances it is allowed to bridge or to shut down any safety equipment.
  The owner has the responsibility to assure functionality of the safety equipment.
  Manipulations on the safety equipment are liable to be prosecuted.

The following security equipment is part of the scope of supply:

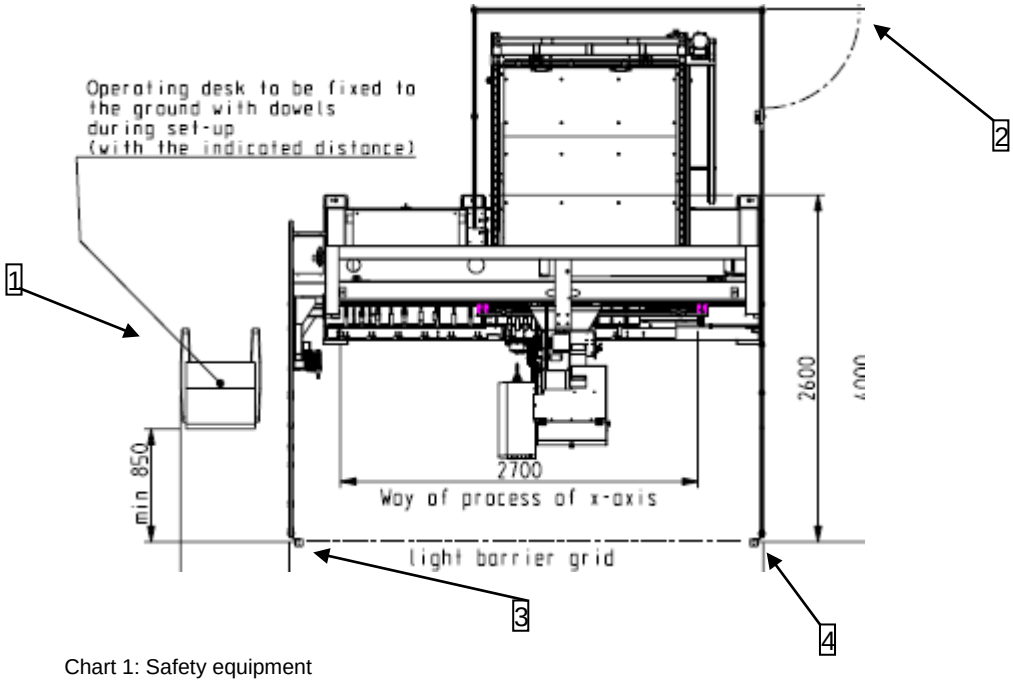


Chart 1: Safety equipment

2.12.1 Switch for emergency cut-off

This switch for emergency cut-off (1) is located at the control desk in close range to the operating field. After activating the switch for emergency cut-off, the machining process will immediately be interrupted.

2.12.2 Photoelectric beam

In order to secure operating field during a machining operation, this operating field has to be secured by an photoelectric beam. The emitter (3) and receiver (4) of this photoelectric beam are placed on the side wings of the security fence which perimeters the operating field.
In case somebody trespasses this area, then the machine will immediately be stopped.

2.12.3 Safety switch for the gate

In order to secure the operating sphere at the rear during operation, this gate will be closed through a door. This door is equipped with a safety interlock, which cuts off the machine in case somebody opens the door during a machining process.

2.13 Emissions

2.13.1 Noise

The determined workplace-oriented emission values L_{pA} according to EN 848-3 are as follows:

- Idle run: 66,5 dB (A)
- Noise at work: 78,8 dB (A)

The measurement uncertainty constant K is 4 dB (A).

The following complements determined through CEN-TC142 have been taken into consideration in order to achieve an accuracy class better than 3 dB:

- The environmental correction factor k3A is ☐ 4 dB
- The difference between background sound pressure level and the sound pressure level is ☐ 6 dB at each measuring point.

Remarks

The values displayed are emission values; therefore they do not have to be considered in the same time as secure workplace values. Since there is no correlation between emission and workplace values, they cannot be taken as reliable in order to find out whether, if need to be, they would become necessary. Factors, which could influence the current workplace value, do contain the duration of interacting, the peculiarity of the worksite, other noise sources, other machines and other adjacent influences. The admissible workplace values may also vary from country to country. However, this information should allow the user, to obtain a better assessment on danger and risk.

The persons using the machine must be informed on the arising noise emissions during normal operation.

2.13.2 Vibrations

There are no vibrations appearing on the machine which could influence the operation.

2.14 Working place of the operator

The working place for the operator is just in front of the machine with view on it and access to the control elements.

3 Functional components on the machine

3.1 Setting

The setting serves for filing and fixing the work pieces to be machined. On the operator's side left as well as on the lower section buffers are located, which serve for positioning the work piece. After having positioned the work piece, the mechanical clamping angles will have to be set and tightened.

The distance bolts can then be placed according to the size of the work piece into the provided bores of the machine table.

3.2 Supports and axis drives

The Perforex BC 1008 HS machining centre has three linear controlled digital CNC axis. The drive in all three axles is being done on behalf of a servomotor with upstream planetary gear. A pinion transfers the rotary move of the motor onto a gear rack. The measurement capture happens through a resolver evaluation of 1024 impulses per motor revolution, which are transferred via the servo inverter onto the control. In order to achieve a long lifetime of the pinion and the gear rack, these will be blown on, during move, with an oil-air-mixture coming from a nozzle, creating a blower noise. Hereto, a separate gear rack oiler will be used. When properly adjusted, an oil film appears on the gear rack.

3.2.1 X-support

For the move of the portal in X-axis direction, the machine table will be mutually guided through a linear guide in recirculation ball guide technology. These guides are being composed of two guide units each. Through this, a precise move of the portal can be achieved all over the machining area. The drive motor is being protectively placed in a frame on the lower side of the portal. Since this drive does not have a break, the portal can be moved by hand in case the machine has been switched off (main switch).

3.2.2 Y-support (cross slide)

For the move in Y-direction the cross slide is located on the portal with integrated Y-drive. This servomotor also transmits the rotary move onto the gear rack. In order to prevent the cross slide from falling down when control is being switched off, the drive motor is equipped with a stop brake which keeps him in position even when there is no current.

3.2.3 Z-support

Again, the feed motion into depth (Z) is fixed onto the cross slide. Here also a servo motor provides the necessary positioning. On this Z-support, the machining unit is being attached rigidly.

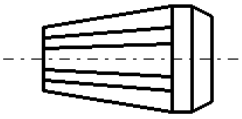
3.2.4 Tool change magazine

The tool change magazine is rigidly fixed on the left hand side of the machine base. As a standard, there are 18 locations for tools. The tools and units are deposited in the grooves of the plastic tool holders. A push button is placed on the support for opening the tool clamping mechanism outside the automatic operation. In the same time the tool socket has to be held by hand, since this one would fall out due to its inclination, when the push button is being activated.

3.3 Drill spindle

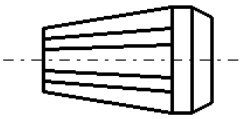
The drilling unit consists of a drill motor with hollow shaft SK 30. With this, various tools (drills, taps, mills and other tools) can automatically be taken out of the tool magazine. The opening of the tool chuck is pneumatic and is supervised through adjustable initiators (Open <-> Closed).

For drilling tasks tool inserts equipped with collets ER 25 according to DIN 6499 B are being used. They are commercially available in clamping ranges from ø1 up to ø16 mm.



Collet ER 25 according to DIN 6499 B

For thread cutting, collets with square guides are forecasted. For these, commercially available collets, which are dedicated to taps from M2,5 to M12, will be requested.



Collet ER25 with square guide (M3 to M12)

3.4 Tool lengths

The tool length of the drills is related to the surface connection of the SK 30 tool pick-ups. The tool length can be adjusted with the help of a tool mounting kit.

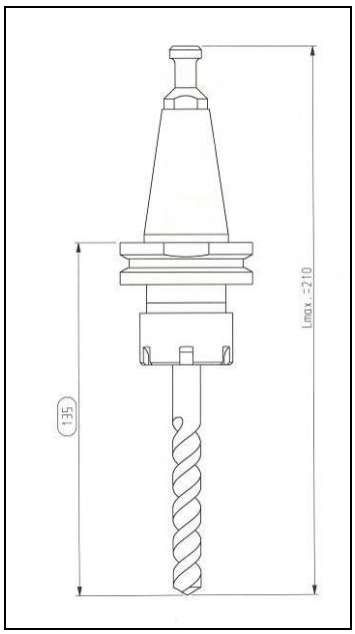


Chart 2: SP 4138 Tool length

3.5 Low quantity lubrication

For lubrication of tools – for example drills, taps and mills – a low quantity lubricating device is being installed. During each drilling, tapping or milling operation it blows a short spray impulse on the tool tip (when drilling or tapping) and a permanent spray on the mill tip during milling. The lubricant quantity can be adjusted through a program for time setting or on the lubrication device itself, in turning the knurled screw.

NOTE	For the protection of the low quantity lubrication device we recommend the use of a MMKS lubricating medium M&K150.

The sight tube must be filled properly and can be refilled in an unpressurized state over the filling plug.

Further information can be obtained through manufacturer's manual.

4 Transport

The Perforex BC 1007-HS machining centre must be transported standing upright.

4.1 Preparatory measures

4.1.1 Scope of supply

Consult the order documents in order to find out the exact scope of supply and compare it with the terms in the delivery note. The delivery papers have listed measures and weights.

4.1.2 Completeness

Check the entire consignment with the enclosed delivery note!
Incidentally we would like to emphasize our conditions for sales and delivery.

4.1.3 Removal of packaging

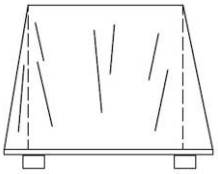
Remove possible waste packaging according to the corresponding rules in your country.

4.2 Packaging

The transport route decides upon the kind of packaging. The machine will be delivered in transport units. All mobile parts, such as cabinet doors, will be secured through plastic straps.

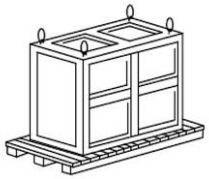
4.2.1 Normal transport

The machine will be delivered in one complete transport unit. This transport unit is bolted onto a wooden crate or on planks.



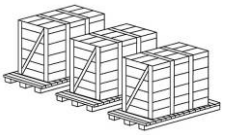
4.2.2 Transport by sea

For transport by sea, the machine will be protected through plastic film and the wooden pallet will additionally be provided with a wooden box.



4.2.3 Airfreight

When transported via airfreight, then the wooden pallets will additionally be provided with a plywood crate.



4.3 Damages

The machine will be loaded with utmost care.

However, should you state during delivery and unpacking any damage on the machine, then please take into consideration the following directives:

- After delivery of the machine with accessories, damages caused by deficient packing or during the transport, should immediately be reported to the carrier, to the insurance company and to the supplier.

- In case the damage is being stated during unpacking, then the consignment must be left unchanged up to the moment of arrival of a representative of the carrier, having been charged with the consultation of the facts.
  The carrier has to be requested immediately through writing to undertake a statement of facts.
  The following periods of notification are being valid:
  a) through postal way - immediately, 24 hours after delivery at the latest,
  b) through railway - immediately, in exceptional cases 7 days after delivery at the latest
  c) through carrier, 4 days after delivery at the latest

- Each damage has to be reported to us immediately with submission of:
  a) statement of facts,
  b) original of corresponding waybill with additional notation:
  " The entitled rights on behalf of this waybill are immediately and irrevocably assigned to the company Fa. Rittal GmbH & Co. KG “
  c) duplicate of invoice.

  Deliveries of replacements or spare parts free of charge for the repair of the corresponding machine may only be undertaken after having received the documents noticed above.

- Damages having an amount higher than € 300,- must be reported through the surveyor of the transport insurer.

WARNING

Prevent the machine of falling down!

There is danger of the machine falling down!

- Neither persons nor objects are allowed to be within the working range!
- The ground has to be secured against unauthorized access!
- The chapter 4 „Transport“ has to be read entirely!
- The load has to be secured during transport in a professional manner!
- During loading operations the machine has to be secured against an unintentional change in position!

4.4 Machine transport with a crane

In order to transport the machine with the help of a crane, the following conditions must be achieved:

Remove the packing and loosen the machine from the pallet.

Bolt the two eyelets M24 into the top cover plate of the machine frame.

WARNING

Prevent the machine of falling down!

There is danger of the machine falling down!

- During transport of the machine with the help of crane, it is absolutely necessary to take into consideration the centre of gravity of the machine!
- Load pick-up devices as well as fixing means must correspond to the regulations for accident preventions!
- The weight of the machine (2.200 kg) has to be considered when selecting the load pick-up devices and fixing means!
- The transport works may only be done through qualified and authorized staff!

4.5 Machine transport with a forklift truck

In order to transport the machine with the help of a forklift truck, the following conditions must be respected:

- Remove the packing and loosen the machine from the pallet.
- The fork length should not be less than 1600 mm in order to avoid tilting during transport!

WARNING

Danger of machine parts falling down!

There is danger of the machine falling down!

- It is essential to take into consideration the centre of gravity of the machine when transporting the boom through a forklift truck!
- Load pick-up devices as well as fixing means must correspond to the regulations for accident preventions!
- Consider the weight of the machine (2.200 kg) when selecting the forklift truck for the transport of the machine!
- The transport works may only be done through qualified and authorized staff!
- Transport ways are to be blocked and characterized in a way, so that no unauthorized person is able to enter the danger area!
- The loading and unloading of the equipment parts as well as the internal transport must take place in using the help of a forklift truck!

DIRECTIVE

Avoid hard shocks during transport, since the accuracy of the machine could be affected and could lead to malfunctions on the machine.

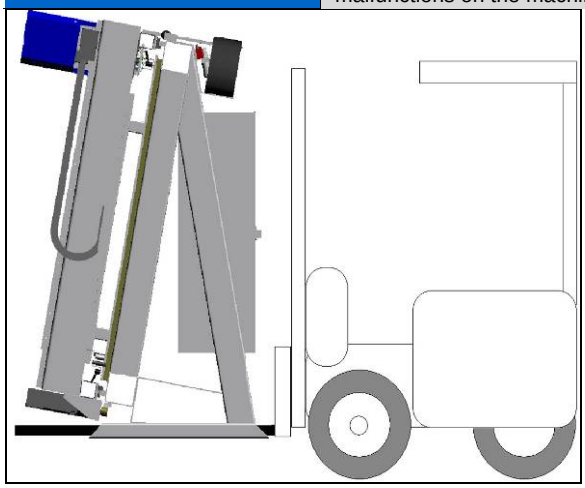


Chart 3: Transport with a forklift truck

5 Assembly

5.1 Installing the machine

CAUTION

Danger due to insufficient lighting at the workshop place!

The machine does not have an own light source.

- Therefore you will have to provide a sufficient lighting for the workshop place (EN 1837:1999 chapter 4.2).!

DIRECTIVE

The assembly affords basic mechanical, pneumatic and electrical knowledge as well knowledge about the corresponding technical terms. In order to ensure security in operation, these tasks may only be achieved by a qualified person or a person having been properly instructed and under guidance of a supervisor.

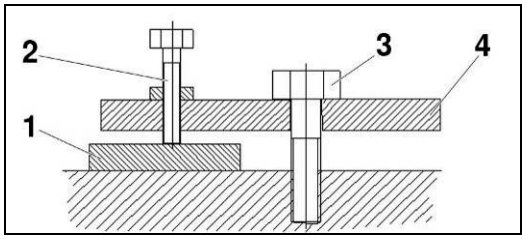


Chart 4: Setting up the machine

On all four edges of the machine as well as in the centre set screws have been placed, which allow a precise alignment of the machine.

The steel plates delivered with serve as base for these set screws.

Optionally the machine can be fixed to the floor through tie rods (heavy-duty dowels) (3). For surface mounting of the machine, you will have to remove the bracket on the front-side underneath the clamping surface.

Only with the machine fixed tight to the floor, you will be able to ensure that it does not shift during operation.

1. Place the machine on solid ground (foundation B25) with a load capacity of min. 10 kN/m² .
2. Align the machine with the help of a water level.
3. At first align the machine in adjusting the external set screws (2).
4. Reset the inner set screws.
5. Align the machine lengthwise in placing the water level on the upper or lower guide track.
6. Push the support aside and clamp a second water level to the support so that this one stands on zero.
7. Push the support to the other side. Whilst doing this the water level may not change. Take care during adjustment that the longitudinal direction does not change.

In order to obtain safe operating of the machining centre BC 1007-HS it is absolutely essential to create a safety margin around the machine.

This safety margin must be:

- at least 1500 mm in front of the machine and
- at least 200 mm behind the machine.

Pleas notice that the accessibility for maintenance jobs on the control cabinet as well as at the rear to the machine is being secured.

DIRECTIVE	The set up may only be done by qualified and trained personnel. Interventions through third persons during the warranty period will be considered as an infringement on the warranty clause and release the manufacturer in this respect.

DIRECTIVE	All security advices must be imperatively observed.

5.2 Electric power supply

DIRECTIVE	Cables being used must correspond to VDE-guidelines! The electric power supply to the three phase network must correspond to the locally valid prescriptions.

DIRECTIVE	Only use numbered cables in order to avoid terminal errors and to simply later controls.

- Lay the electrical cables for current supply onto the terminal box according to the wiring diagram and to the specifications given by Fa. Rittal GmbH & Co. KG.
- Check if the operating voltage and frequency indicated on the name-plate do correspond to the values of your network.

DIRECTIVE	Whilst separating the phase grounding on the secondary side of the control transformer, the mounting of an insulation monitoring will absolutely be necessary.

- When switching on for the first time please take care of the correct direction of rotation. When direction of rotation is wrong, then please swap the two phases on the terminals (outer conductor L1 and L2).

5.3 Pneumatic connection

The hose for the compressed air supply must have an inside diameter of 10 mm.

It is being connected to the spout of the quick connect of the maintenance unit.

The maximum admissible inlet pressure into the maintenance unit may not be superior to 8 bar.
The operating pressure is 6 bar and can be adjusted at the maintenance unit.

5.4 Preparatory measures

WARNING

Unpredictable movements on the machine!

Danger of unpredictable movement of the vertical support.

- During jobs on the vertical support take care, that the brake of the drive motor is not ventilated!

5.4.1 Transport securing devices

Several mobile assemblies are anchored for the transport.

These anchorages have to be loosened before starting up the machine.

- The horizontal support (X-support)) is being fixed with a bolt to the upper portal of the machine frame.
- The vertical support (Y-support) is being supported with an angle.
  After having properly connected and switched on the machine, the Y-axis can slowly be moved upwards a few centimeters by hand, even in a non calibrated state.
  Check before taking off the angle, if the brake of the Y-axis is still active at “control off“.
- The Z-axis is not secured.
  Remove the protective cap from the drilling aggregate.

5.4.2 Removal of antirust agent

- Clean all blank parts from preservatives.
- Do not use steel brushes or blades for this task!
- Grease all unpainted parts.
- Take care that the prescriptions for dealing with cleansing agents are being observed.
  Check the compatibility of cleansing agents and preservatives.

5.5 Installation plan

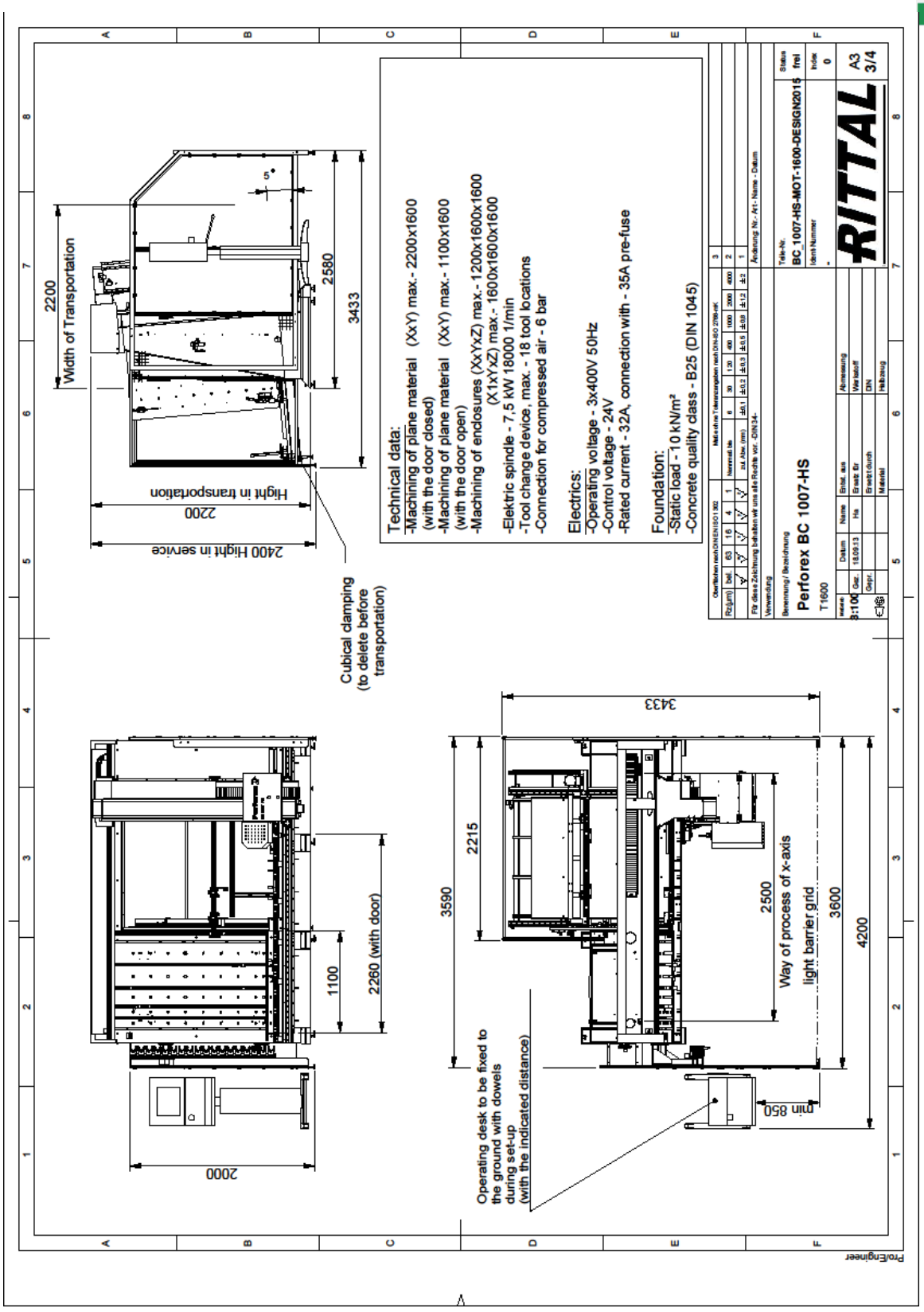


Chart 5: AGA_6021 Installation plan

6 Initial operation

1. Connect the machine to the locally installed current and compressed air supply.

DIRECTIVE	Current supply: 400V 50Hz Compressed air supply: 6 bar filtered compressed air

2. Open the stop-cock at the maintenance unit.

3. Close the cover and check the protection devices.

4. Check the switch for emergency cut-off.

DIRECTIVE	The security photoelectric security beams supervise the security area in front of the machine. After having started the program these ones become active, so that during access to the security area, the machine will immediately get into the state of emergency cut-off. Therefore do not enter the security area after having started the program!

Calibrating the machine

The axis drives are equipped with servo motors having resolver technology.
Since the resolvers loose their current traversing positions when power failure occurs or when the main switch has been switched off, the entire equipment must be calibrated during start up.
The machine's zero point lies in X-direction on the lateral stop left, in Y-direction on the angle bracket and in Z-direction on the pin surface (= work piece supporting surface). He refers to the back part of the tool inserts.

5. Set the main switch on „I“ .

6. After having switched on the main switch, the control as well as the PC boots.
   The graphical operating surface appears on the screen.

7. Push the key „OPERATION ON“ (control voltage as well as servo controller “on”).
   The illuminated push-buttons will now be illuminated and the axle drives are in control.
   Now, the referential drive of the axles can take place under the corresponding guidance.

DIRECTIVE	The security area is activated as soon as the machine goes into operation. When entering the security area, the emergency cut-off will immediately be switched on. This has to be avoided especially during the calibration drive, because then the calibration values are being taken over wrongly. In this case the entire calibration procedure will have to be repeated.

DIRECTIVE	If a support stands on a limit switch, it will be displayed on the screen and the calibration drive does not function properly. Remedy can be obtained through manual leave with<+ or -> keys until the limit switch is free.

Prerequisites for starting the program

- The positions of the distance pins must be exact, otherwise said the size of the work piece and the machining task must be adapted.
- The requested tools must be mounted and deposited in the tool file as well as in the control.
- The corresponding machining programs must be set.

As soon as the machine is operating, the security area is activated. When entering this security area, an emergency cut-off will happen instantly. This must be especially avoided in the case of calibration drive, because then the calibrations values will be taken over wrongly and in this case, the entire calibration procedure will have to be repeated.

DIRECTIVE	Check if the tool data in the control are in conformity with the real equipment.

7 Operation

For operating the graphical software please consult the detailed description in the separate handbook.

1. Position the corresponding work piece.
2. Push the work piece against the lateral buffers.
3. Tighten the work piece on top and on the bottom.
4. Start the requested program.
5. Machining starts
6. After having finished the machining program, the support then drives towards the programmed waiting point.
7. Enter the security area.
8. Release the work piece.
9. Take away the work piece.

8 Search for errors and their remedy

8.1 This is the way to proceed

- Even if you are under time pressure, proceed systematically and selectively. Randomly or thoughtless dismantling or modification of set values may lead to the result, that the original source of error cannot be detected anymore.
- Look for an overview on the functionality of the equipment.
- Try to clear up, whether the equipment has rendered the requested performance or not.
- Try to capture the modifications.
- Operating conditions or field of application, have these been modified?
- Have modifications or repairs taken place on the overall system (equipment, electrics, control)? If yes: which ones?
- Has the equipment been operated according to given instructions?
- What is the feature of this disturbance?
- Create yourself a clear perception on the cause of the error. Question, if necessary directly the operator or the plant operator.

DANGER

Danger to life when touching current-carrying parts !

- Before opening the machine it is absolutely essential to switch off the current supply!

8.2 Disturbances

Message / Disturbance	Cause	Remedy
Control cannot be switched on	no compressed air available	establish compressed air supply
	not enough pressure (< 5,5 bar)	check pressure and raise eventually
	emergency cut-off switch engaged	release emergency cut-off switch
	another security device being engaged	switch off control and restart
Program doesn't start / control cannot be switched on	X-, Y or Z-Axles are in final position	withdraw the corresponding axis out of final position by hand
	no operational readiness of governors existing	
	security area is not clear	clear security area
	given travelling range is too large	correct software-final position

Chart 3: Disturbances

9 Maintenance and repairs

9.1 General directives

The listed maintenance jobs may only be done through trained, instructed and qualified personnel.
For further tasks to be undertaken, please immediately consult employees of the company Fa. Rittal GmbH & Co. KG for this purpose.

DANGER

Danger to life!

- Before maintenance or repair tasks on the machine, make sure that the machine has been cut off from currency and compressed air supply!

DIRECTIVE

For maintenance tasks on the machine, protection devices must be partly removed or put out of service. Hence there is a risk of increased risk of accident during these maintenance tasks.

DIRECTIVE

Instantly after maintenance all protection devices and machine covers must be put back into their original place before restarting the machine and perhaps activated if necessary.

9.2 Cleaning

DIRECTIVE

Wear gloves during all maintenance, repair and cleaning tasks!

Clean the machine each day after having finished the jobs as follows:

- Clean the machine from shavings, especially in the area of functional parts, such as gear racks and linear guides!
- Clean the motor ventilator bonnets in order to obtain the best motor cooling.
- Clean the filter inserts of the ventilation units in the control cabinet once per week and replace them if necessary.
- Remove dust or dirt once a week on all bright parts, such as tool socket and guides. Afterwards slightly lubricate these bright parts as well as the actors.

DIRECTIVE

Take care that whilst blowing off dust or dirt with compressed air, that the air jet is not directed straight towards the bearing positions of the drill spindles or other outputs.
Prefer the use of a suction cleaner.

- Periodically clean the sinter filter of the maintenance unit from oil and floating particles in using petrol or petroleum and blow it dry with compressed air.

- Clean the plastic containers exclusively with water, petroleum or special benzines. Unbolt these anticlockwise in an unpressurized state.
  ATTENTION: normal petrol from gas stations is no benzine!

DIRECTIVE	Do not use, under no circumstances, petrol, benzene, acetone or other treble contained cleansing agents or similar to these for cleaning the containers. The oil to be filled in may not be diluted or mixed with liquids containing softeners, such as alcohol, glysantin etc.

- Daily clean the hollow shaft of the drilling aggregate.
- Equally clean each day the lenses of the light barrier or – in case of warning message – instantly.
  Use a soft cloth or a cleansing agent (glass cleaner generally used in commerce).

DIRECTIVE	Do not use, under no circumstances, solvents or cleansing agents which contain acetone. The housing window could tarnish then.

- Regularly clean the flat guides of the X-, Y- and Z-supports und slightly lubricate these.

9.3 Inspection

At regular intervals, because of security reasons, the machine has to have a thorough control through a correspondingly trained specialist.

- Check the security of the electrical installation, in particular the cable insulations.
- Check the state of the power feed cable and the motor cable on appearing damages , as for example abrasions or cuts.
- Check the functionality of the security devices as well as the emergency cut-off!
- Check the maintenance unit on functionality and soilings.
- Check the rack and pinion drive if there is enough lubrication (displayed through a sufficient oil film). Eventually check the function of the oiler.
- Maintain the machine according to the terms in our maintenance schedule (chapter 9.4.1 „maintenance schedule“).
- Check the clamping force of the tool sockets every three months.
  In case of appearance of latitude between the tool gripper and the groove, then the holder will have to be replaced.

9.4 Lubrication

- Grease nipples are fixed to the flat guides of X-, Y- und Z-supports, one for each. They are to be greased in monthly intervals (grease according to DIN 51818 KP2K; consistency class NLGI 2).
  For this purpose drive the Y-support down to the bottom in order to have access to the upper guide carriages of the Y-axis.
  Drive the Y-Support in its highest position in order to have access to the lower grease nipples.
  Same procedure for the Z-axis on the cross slide.

- For the lubrication of the gear rack, lubricated air is blown onto the pinion.
  A gear rack oiler is being used for the oil supply. This one has to be regularly filled up (kind of oil as well as dosage according to chapter 9.4.1 „maintenance schedule“).
  The motorized depth stop should be regularly lubricated by hand.

9.4.1 Maintenance schedule

	If case of necessity	daily	weekly 50 h	monthly 200 h	¼-jearly 600 h	Remarks
Inspection						
- electoral installation		☑				
- protective appliance		☑				
- maintenance unit	☑					
-rack and pinion drive	☑					
- tool sockets	☑					
Cleansing						
- machine in general	☑					
- gear racks - linear guidings	☑	☑				
- filter inserts in control cabinet		☑				
- tool sockets - guidings		☑				
- sinter filter maintenance unit	☑					
- light barrier	☑					
- hollow shaft of drill aggregate	☑					
Lubrication						
- linear guidings of support			☑	☑		1 – 2 cm^3 ②
- gear rack oiler			☑			fill up: 0,25 l ①
- guide carriages of motorized depth stop				☑		1 – 2 cm^3 ②
- tool			☑			③
- gear rack - guidings	☑			☑		④
- guide shafts of the pressure plate - pneumatic panel clamping			☑			④

Chart 4: Maintenance schedule

9.4.2 Recommended lubricants

①	ISO VG 32	DIN 51524	(ID.-No. 1072347 Rittal- Article No. 4050862)
②	KP2K-NLGI2	DIN 51818	(ID.-No. 1072354 Rittal- Article No. 4050863)
③	M+K 150 MMS OIL	Müller + Karle company in Rheinstetten	(ID.-No. 1057629 Rittal- Article No. 4050861)
④	MOS^2 creep oil	Caramba	

9.4.3 General view maintenance

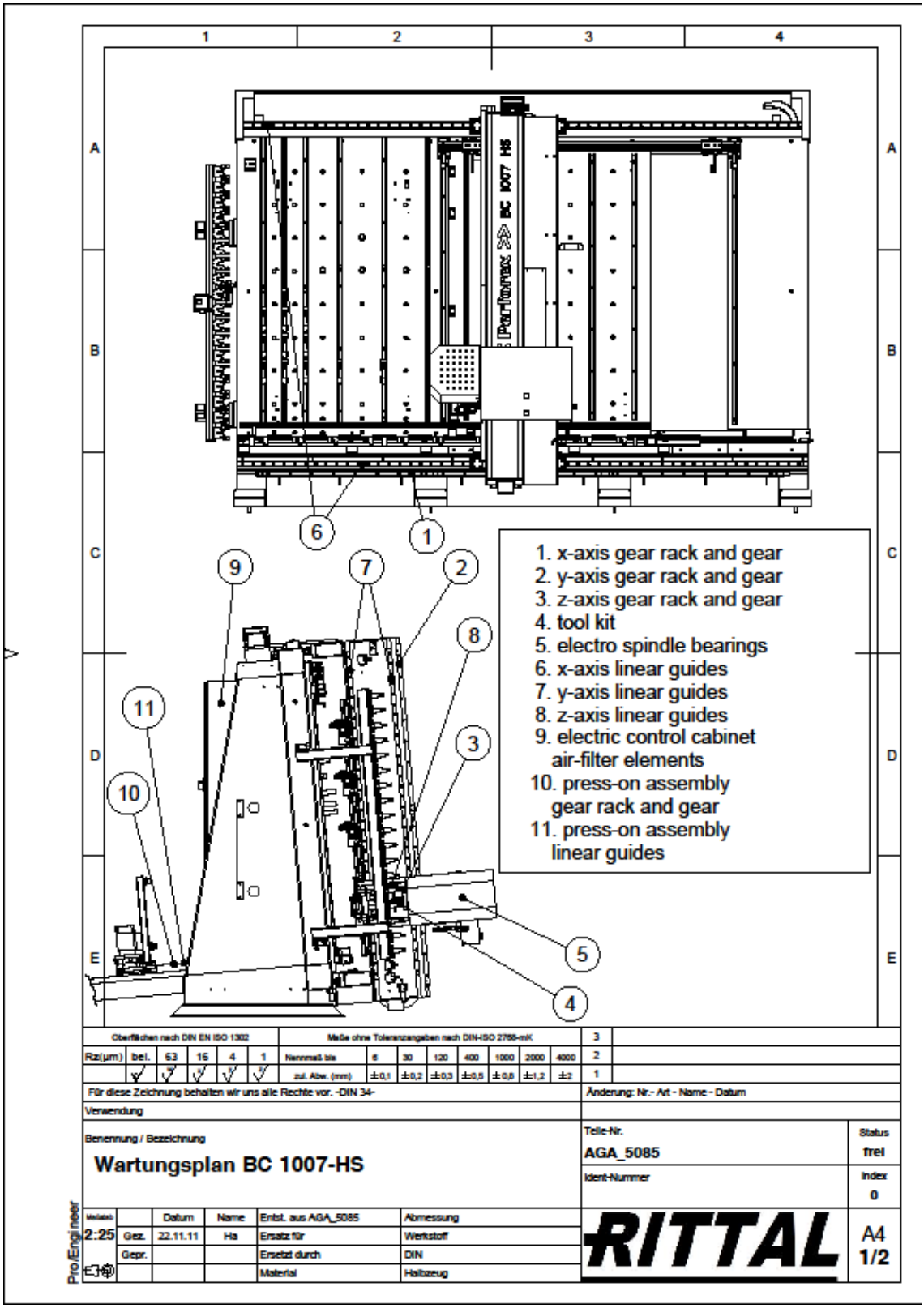


Chart 6: AGA_5085 General view maintenance

10 Waste removal

10.1 Environment protection

Careless removal of scrap and other waste components may lead to pollution.

- If this is the case with the machine, please return it then to **Fa. Rittal GmbH & Co. KG**.

11 Annex

11.1 Technical data

Dimensions (safety fence incl.)		
Width	[mm]	3.570
Height	[mm]	2.410
Depth	[mm]	3.490
Dimensions control panels		
Length	[mm]	250 – 2.200 (1.100 door open)
Width	[mm]	95 – 1.600 (1.700 door open)
Depth	[mm]	1 – 10

Dimensions cubicles		
Width (X)	[mm]	90 – 1.400
Height (Y)	[mm]	100 – 1.600
Depth (Z)	[mm]	110 – 1.600
Weight	**[kg]**	**2.200**
Travelling ranges		
X-axis	[mm]	2.500
Y-axis	[mm]	1.700
Z-axis	[mm]	315
Velocities (rapid move)		
X-axis	[$^{m}/_{min}$]	60
Y-axis	[$^{m}/_{min}$]	60
Z-axis	[$^{m}/_{min}$]	20
Electric spindle		
Torque	[Nm]	7,5
r.p.m.	[min^{-1}]	0 – 18.000
Tool changing device		
Tool magazine		stationary
Tool locations	[pieces]	18
Centre distance	[mm]	88
Standard kit		
Collet for drills		ø 3 – ø7
Collet for taps		M4; M5; M6; M8
Cooling / lubrication		minimum quantity lubrication directly on drill
Pneumatics		
Connection	[mm] LW	10
Operating pressure	bar	6
Air consumption	[$^{NL}/_{min}$]	150 – 200
Control	Type	CNC-4-axis control type ferrocontrol
Safety equipment	Kind	photoelectric beams

Chart 5: Technical data

- For electrical connected ratings consult electrical documentation or wiring diagrams

11.2 EU-Declaration of Conformity

Chart 7: EU-Declaration of Conformity

11.3 Machine record card

Machine chart according to *AWF*-sample Machine type: << *Perforex* >> BC 1007 HS			Inventory-No.:
Description	Working Centre for mounting plates	Year of construction: 2016	Order-No.:
Type:	<< *Perforex* >> BC 1007 HS	Date of delivery:	Date of invoice:
Machine-No.:	324 58 1xx	Installation:	Invoice-No.:
Manufacturer	RITTAL GmbH & Co. KG	Place:	Account-No:
Supplier:	RITTAL GmbH & Co. KG	Machine group:	Purchase price:

Function:
4-axis-CNC-Working centre for drilling, threading and milling of cabinet mounting plates with 5 degree vertical standing working table, integrated in machine body.

A. TECHNICAL DATAS:

No.	Description	Qty.	ME	Item	Description	Qty.	ME
1	Machine measurements in total (AGA 6021)			4	Operating power (see Electric Documentation)		
	Transportation length	3270	mm				
	Length incl. fence guard	3570	mm		Nominal current	22,0	A
	Transportation width	2100	mm		Operating voltage	400	V
	Width incl. cube conditioning	3490	mm		Control voltage	24	V
	Transportation height	2375	mm				
	Height maximum	2410	mm		Utilization factor		%
	Weight	2200	kg				
2	Measurements work piece / mounting plates			5	Compressed air		
	Length(X) minimum	250	mm		Necessary compression	6	bar
	Length(X) maximum	2200	mm		Air consumption	150	L/min
	Width (Y) minimum	95	mm		Utilization factor	30	%
	Width (Y) maximum	1600	mm				
	Height / Thickness minimum	1	mm	6	Special Machine datas		
	Height / Thickness maximum	10	mm		Displacing speed X-axis	20	m/min
	maximum bending height	90	mm		Displacing speed Y-axis	20	m/min
					Displacing speed Z-axis	6	m/min
3	Measurements work piece / cube				Number of revolutions E-spindle	18000	min^{-1}
	Length/Depth (stop) minimum	110	mm				
	Length/Depth (stop) maximum	1600	mm		Maximum tool places	18	pcs
	Width (X) minimum	90	mm				
	Width (X) maximum	1400	mm				
	Height (Y) minimum	100	mm	7	Tool lubrication		
	Height (Y) maximum	1600	mm		Drilling, threading and milling:	0,25	ltr.
					Splash lubrication		

B. LIST OF MOTORS:

No	Qty.	Type and construction	Product	Nominal torque [Nm]	Nomi-nal Speed	Nom.voltage [V]	Nom.current (A)	Protec-tion category	Insulant category
X	1	Servom. FMD 056-03-60-SNK-01	Ferrocon-	1.8	6000	400	2,5	IP 65	F
Y	1	Servom. FMD 056-04-45-SBK-01	Ferrocon-	3,0	4500	400	2,71	IP 65	F
Z	1	Servom. FMD 056-01-60-SBK-01	Ferrocon-	0,9	6000	400	1,23	IP 65	F
C	1	Electro spindle ES939A 4P 06	HSD	7,5	6000	380	15,0	IP 65	H

Chart 8: Machine record card page 1

C. SPAREPARTS LIST see Manual

No.	endurance [months]	units	quantity	Term	Product	Type order number	Note

D. Tools

Drilling tools — Grooved bit Ø 2 - 10 mm

Threading tools — Screw tap M3 to M12

E. TOOL HOLDER

Standard with collets ER 25

For drill bits Ø2 – Ø7 mm, optional up to Ø13 mm

For screw taps M4, M5, M6, M8, optional M2,5, M3, M10, M12

F. PERFORMED REPAIRS:

No.	Procedure	Spare part No.	Execution internal / external	Date	Notes

G. NOTES

Chart 9: Machine record card page 2

12 Lists and plans

12.1 Bill of materials / spare parts

12.1.1 RM 6050 Machine frame 1071778

1	Machine frame	RM_6049	1071844			
1	Horizontal pipe	ROE_4296	1000934	150x5 3270 lg.	59411	ST37
2	Pipe vertically	ROE_4297	1000942	150x5 1700 lg.	59411	ST37
1	Horizontal pipe	ROE_4330	1065655	150x150x5-3270	59411	ST37
2	Belt guides	RM_5472-3		40x15x3270	1017	ST37
1	Partition	BLF_6386	10072438	6x1055x3270	1541	ST37
1	Strut	BLF_5095	1000975	5x1000x1700	1541	ST37
1	Strut	BLF_5100	1000967	5x1000x1700	1541	ST37
1	Tube foot	ROE_5076-2	1089853	180x80x10 1120	59411	St37-2
1	Tube foot	ROE_5076-1	1089846	180x80x10 1120	59411	St37-2
1	Belt rack	RM_5472-4		20x20x3050	1014	ST37
1	Cover plate	BLF_5096	1000983	5x400x3270	1541	ST37
2	Tube foot	ROE_5079	500959	180x80x10 980	59411	ST37
2	Stop	HBF_4786	501098	50/40x70	1017	10038
4	Sheet metal blank	RM_5472-10	198259	140x140x3.0	1541	10038
1	Pipe vertically	ROE_5034	1072404	150x150x5-1700	59411	ST37
1	Strut	BLF_5101	1000959	5x150x180	1541	ST37
2	Plate	RM_6025-7		Fl. 90x20-150	1017	10038
6	Plate	RM_6049-1		Fl. 60x25-92	1017	10038
1	Plate	RM_6049-2		Fl. 100x15-110	1017	10038
1	Tabletop	HPL_5040	1072453	25x1210x1725		
1	Tabletop	HPL_4519	1002559	25x460x1815		
2	Guide rail INA	FHS_4915	1000850	24.5x23x3236		
1	Tabletop	HPL_5042	1072479	25x92x320		
1	Tabletop	HPL_4523	1002567	25x70x1600		
1	Tabletop	HPL_5041	1072461	25x145x139		
3	Thrust Bolts	BZA_4700	851279	Ø28x104		
1	Workpiece clamp assy.	WP_4097-1	1065713			
6	Adjusting rail	FHS_5180	1065671	28x12x14x2 1640 lg.		
1	Adjusting rail	FHS_4925	1002385	28x12x14x2 1190 lg.		

11	Hold-down	WP_4098	1003672			
1	Sliding block	YR_4008	1003680	20x28x40		
1	Special Mother	YBE_4001	20412	Fl 20x5x28		
1	Threaded pin	D913-M08X40	121863	M8x40	913	
1	Grommet	GUT_1000	284810			
1	Z-profile	BLF_4912	189100	4 dick	1543	
1	Cam	HB_4400	1003698			
1	Shrink tubing	SLA_300002	219030			
34	Countersunk I-6-ct.	D7991-M6X12	122572		7991	
6	Thrust Bolts cpl.	SP_4151	1002401			
1	Edition	BZA_4749	1002427	Ø25x78		
1	Sliding block	YR_4007	539734			
1	Special Mother	YBE_4001	20412	Fl 20x5x28		
1	Threaded pin	D913-M08X25	121848	M8x25	913	
2	Spacer plate	BLF_4983	626861	50x25x20		
1	Pipe / initiator support	RAM_4475	937417	60x60x4 60 lg	2395	
1	Initiator M8x1	EG_512	661124			
1	Spring D-151A	FRD_368	19372	Ø11x21.4-Ø1		
1	Chip collection sheet	BLF_5114	1001015	1,5 dick	1541	
3	Rack	ZST_4065	497628	24x24x1000	Atlanta	
2	Intermediate plate	PLE_6166	753970	4x70x120	174	
3	Limit switch	EG_1000.prt	906842			
1	Guide chain X-axis	KV_4243	1038512			
1	Thrust Bolts, short	BZA_4705	804518	Ø28x83		
1	Thrust Bolts cpl.	SP_4152	1003649			
1	Edition	BZA_4757	1003623	Ø25x57		
1	Sliding block	YR_4007	539734			
1	Special Mother	YBE_4001	20412	Fl 20x5x28		
1	Threaded pin	D913-M08X25	121848	M8x25	913	
1	Maintenance unit comple-tely	SE_4330	779405 ?			
1	Maintenance unit	WE_4023	1056977			
1	Angle screw-in	WGN_419	77875			
1	Coupling Plug	WGN_4066	766816			

1	Coupling socket	VK_4054	760553			
1	Straight screw-in connection	WGN_339	901			
1	Hose	WGN_364	20040			
1	Angle	BLF_4410	673301			
1	Hex nut	D936_M30	872036		934	
4	Cover plate	BLF_6387	1072495	2mm dick		
8	Hex bolt	D933-M16X80	121624		933	
8	Hex nut	D934-M16	122192		934	
2	Cover plate	BLF_6395	1072511	dick 2mm		
1	Cover plate	BLF_6396	1072503	dick 2mm		
16	Sealing strip	FRE_4103	670471	30x4 -16m		
21	Cylinder head screw with inner hexagon Plate	D912-M08X30	325902	M8x30	912	
6	Cylinder head screw with inner hexagon Plate	D6912-M04X25	731158	M4x25	6912	
9	Cylinder head screw with inner hexagon Plate	D912-M06X8	119537	M6x8	912	

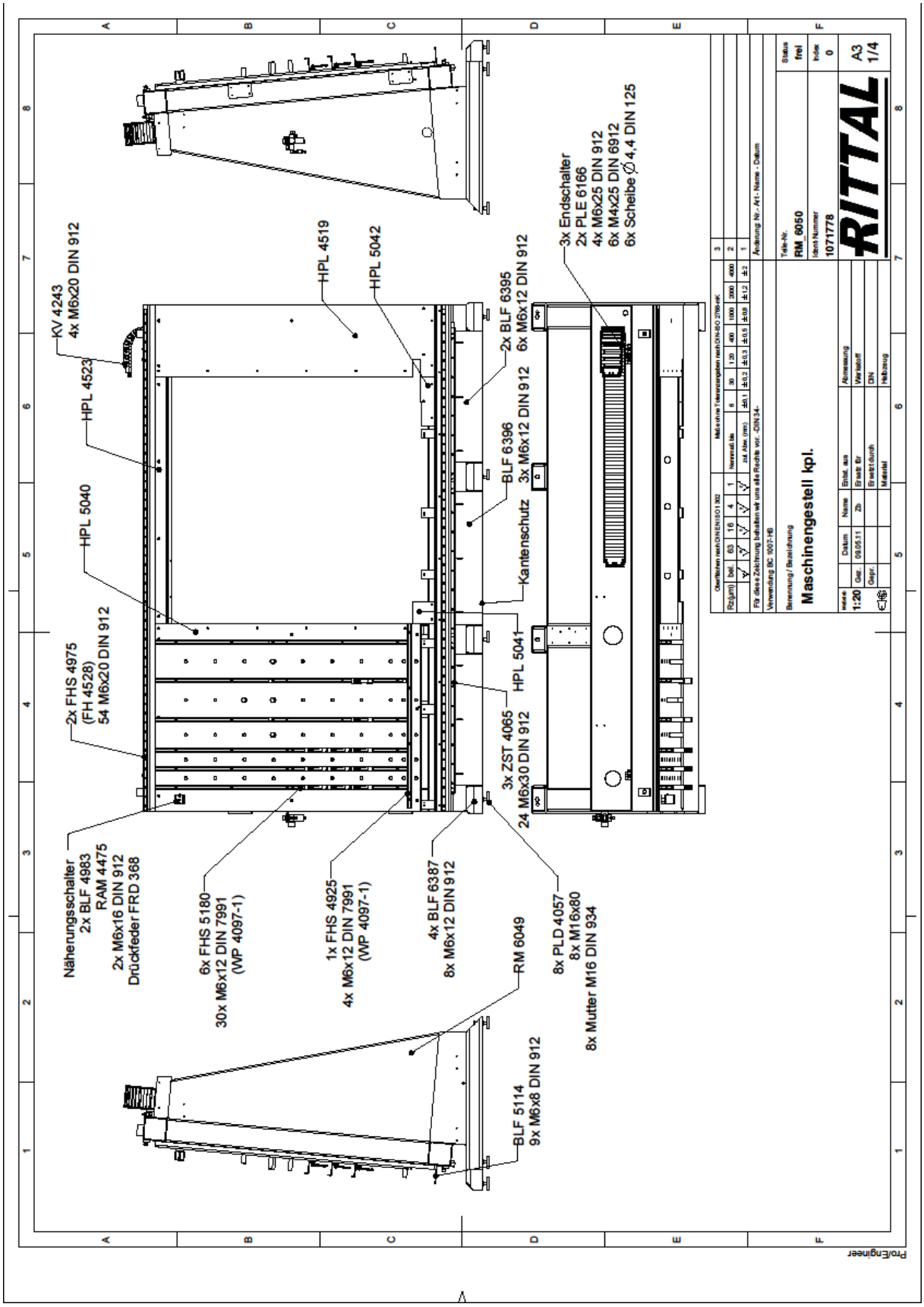


Chart 10: Machine frame complete

12.1.2 PL 6002 Cross slide complete 1056302

1	Y plate	PLE_6217	135624	20x280x600	
2	Pressure block	BOK_4169	838359	20x12x50	174
1	cam	NOK_4057	936328	25x40x130	174
1	Drive Y axis	EM_6008			
1	servo drive	EM_4090	747337		
1	motor bracket	PL_4520	819284		
1	perforated plate	PL_4520-1		10x100x100	1017
2	Side plate motor bracket	PL_4520-2		8x60x63	1017
1	perforated plate	PL_4520-3		8x70x130	1017
1	Motor bracket part	PL_4520-4		8x30x74	1017
1	Helical cut gear	ZRS_4104	936393	Ø47x40	
4	carriages	FBX_4012	747105		
1	Drive Z-axis	Z-ACHSE_HS			
1	electric motor	EM_4144	919142		
1	gear	ZRS_4076	747352		
1	motor plate	PLE_6247	1011717	100x8-136	174
2	guide rail	FHS_4913	???	536x24.5x23	
1	motor mount	PLE_6219	135616	20x254x430	
1	Spindle	EM_6001	1059310??	ES919 SK30 5.5kW	
1	Cylinder head screw with inner hexagon .	D912-M08X25	325886	M8x25	912
1	ASM tool holder d42	SP_4138	410910	SK30/ER25	
1	Elastic collet	ZGS_4028	601278		
1	Pull Studs	BZA_5074			
1	cam	NOK_4070	109207	Fl. 20x25-60	174
4	carriages	FBX_4012	747105		
1	Cover Z-axis	BLF_6096	1059351	1.5 dick	1541
1	Rack Z-axis	ZST_4083	112383	30x25x370	
1	Cylinder head screw with inner hexagon .	D912-M08X35	119727		912
1	Hex nut	D934-M8	122119		934
4	cylinder pin	D6325-6X28	123935		6325
3	Cylinder head screw with inner hexagon .	D6912-M06X12	325340		6912
1	Presser see Kap.12.1.5	LA_4350	104844		

1	rubber buffer	GUT_1001	201186	Ø40x31	
1	initiator M8x1	EG_352102	125534		
2	initiator M8x1	EG_352103	125500		
1	mounting plate	PLE_6222	134858	530x340x10	1745
1	Cylinder head screw with inner hexagon .	D912-M06X20	119602	M6 x 20	912
2	threaded pin	D913-M08X25	121848	M8x25	913
1	hood	BLF_6097	1059328	1.5mm dick	
1	cover plate	BLF_5075	134577	dick 2mm	1541
1	Minimum quantity Greaser Müller & Karle	WE_4024	1057611		
4	distance bolts	BZA_5020	1059369	M4x40 SW7	
1	distributor housing	SK_4090	1014554	qdr.130x99	
1	distribution Box	GHE_4085_1-2			
1	Cover for distribution housing	GH_4085_2			
3	cable gland	SKINTOP_M25	877985	M25x1.5	
1	mist lubricator	WE_4012	947465		
5	5/2 way valve 1/4 "	VK_4108	430579		
2	connection distributor	WGN_4127	990002		
4	Banjo bolt, short fin.	WGN_4125	415570		
2	Pressure control valve	WE_4001	23432	NL2-G1/4"	
2	Hinge compl. 180 °	GT_1004	821785		
1	holder	BLF_6099	1059286		
1	bolt	BZA_5021	1059377	Ø10x200	
1	cover	BLF_6098	1059336		1541
2	flap	HBF_4827	843235	20/5x60	
3	Star knob M6	D6336-M06	777532	M6x32	6336
2	bolt	BZA_4716	826982	SW 17x152	176
2	bolt	BZA_4746	125278	SW 17x398	176
1	Holder	HBF 4858	92304	40x80x145	668
4	Bushing		152 090	20x23x20	
5	Cylinder head screw allen		119 636	M6x30	912
1	Standard cylinder DSNU ISO 6432	ZYL_D25_H50	91835	cyl. ∅25; stroke 50; connection axial; DSNU-25-50-PPV-MA	

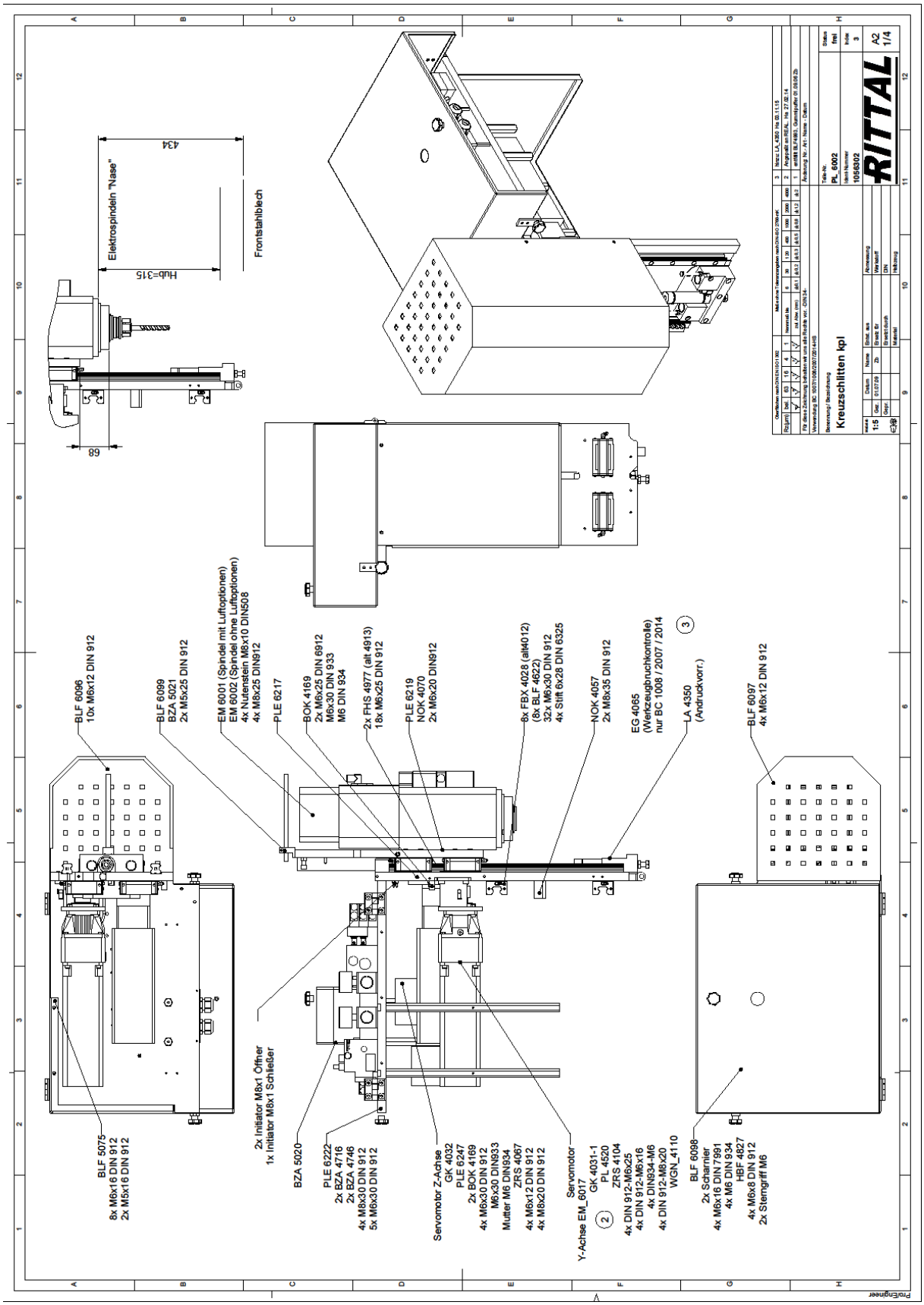


Chart 11: Cross slide complete

12.1.3 PL 4844-2 Portal complete 1065689

1	Portal	PL 6010	1065705			
1	Guide track Y-axis	FH 4529	1036193	Variant A - Variant B		
16	Cylinder head screw with inner hexagon.		119 636	M6x30	912	12.9
64	Cylinder head screw with inner hexagon.		119 610	M6x25	912	12.9
2	Gear rack	ZST 4065	497628	Module 2		
16	Cylinder head screw with inner hexagon.		119 636	M6x30	912	12.9
1	Cable tow Y-axis	KV 4237	1000876			
1	Buffer log	HBF 4565	796326	40x40x50	178	St37k
2	Cylinder head screw with inner hexagon.		119 750	M8x40	912	
1	Stopper		201 186	RD 40x33		
3	Limit switch	SCH300001	906842	608.5117.002		
2	Stopper		464 685	KP/D 50-68		
1	Cable tow holder	BLF 5111	1002153	120x15x550	174	St37k
4	Cylinder head screw with inner hexagon.		325 886	M8x25	912	
2	Spacer bolt	BZA 4750	1002146	SW17x70	176	9S20K
2	Cylinder head screw		325 886	M8x25	912	
1	Planetary gear	GK 4039-1	1061381	P321ME i=1:10		
1	Gear	ZRS 4120	496059	∅47x40		CuZnAl2
1	Washer		125195	M6	9021	
1	Cylinder head screw		124 438	M8x16	7984	
1	Motor plate	BLF 6148	1061506	Fl. 20x140-88	174	St37k
1	Buffer log	HBF 4660	914614	40x40x50	178	St37k
4	Cylinder head screw with inner hexagon.		119 750	M8x30	912	8.8
1	Shock absorber	ZO 4000	914606	M25x1.5 SC 925 HDM-2		
1	Plate	BLF 5115	1002138	20x2-440	174	St.37K
5	Cylinder head screw with inner hexagon.		325 886	M5x16	912	
1	Rubber deflector	FRE 4108	1002120	50x4 - 440	foam rubber	
1	Fastening plate	PLE 6278	1033646	Fl. 30x15-60	1770	aluminum
1	Limit switch	SCH300016	389999	608.6187.042		
1	Cylinder head screw with inner hexagon.		119602	M6x20	912	

6	Cylinder head screw with inner hexagon.		731158	M4x25	6912	
1	Cylinder head screw with inner hexagon.		119 602	M6x20	912	
4	Cylinder head screw with inner hexagon.		119 719	M8x20	912	
4	Cylinder head screw with inner hexagon.		39 438	M5x16	912	
2	Cylinder head screw with inner hexagon.		114 702	M4x35	6912	
2	Counter sunk screw		122 572	M6x12	7991	
2	Buffer log	BLF 6388	1071489	15x20-75	174	St.37K
2	Limit plate	BLF 6389	1071497	8x20-40	174	St.37K
4	Cylinder head screw with inner hexagon.		119 610	M6x25	912	
4	Cylinder head screw with inner hexagon.		492 090	M5x30	912	
2	Cylinder head screw with inner hexagon.		119 727	M8x35	912	
2	Hex-nut		122 119	M8	934	

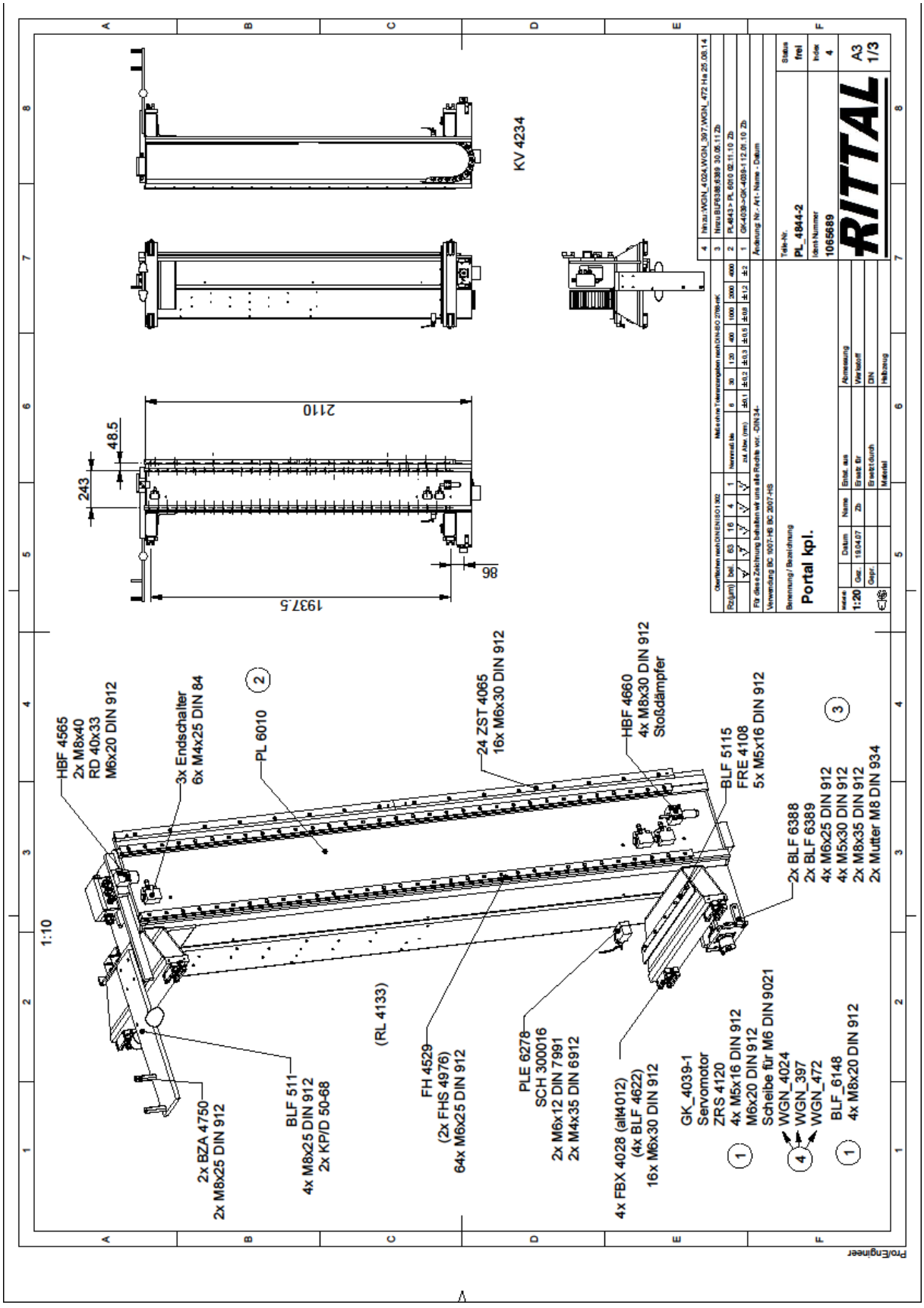


Chart 12: Portal complete

12.1.4 PL 4845 Tool changer 1002161

1	Tool change portal	RM 6019	1058080			
18	Grab claw	ZGS 4024	863258	ISO30 / HSK-E40 Article no. H7501A9300	3	
36	Cylinder head screw with inner hexagon.		119 610	M6x25	912	8.8
36	Toothed washer		326 306	∅6,4	6797	
4	Cylinder head screw with inner hexagon.		119 560	M6x12	912	8.8

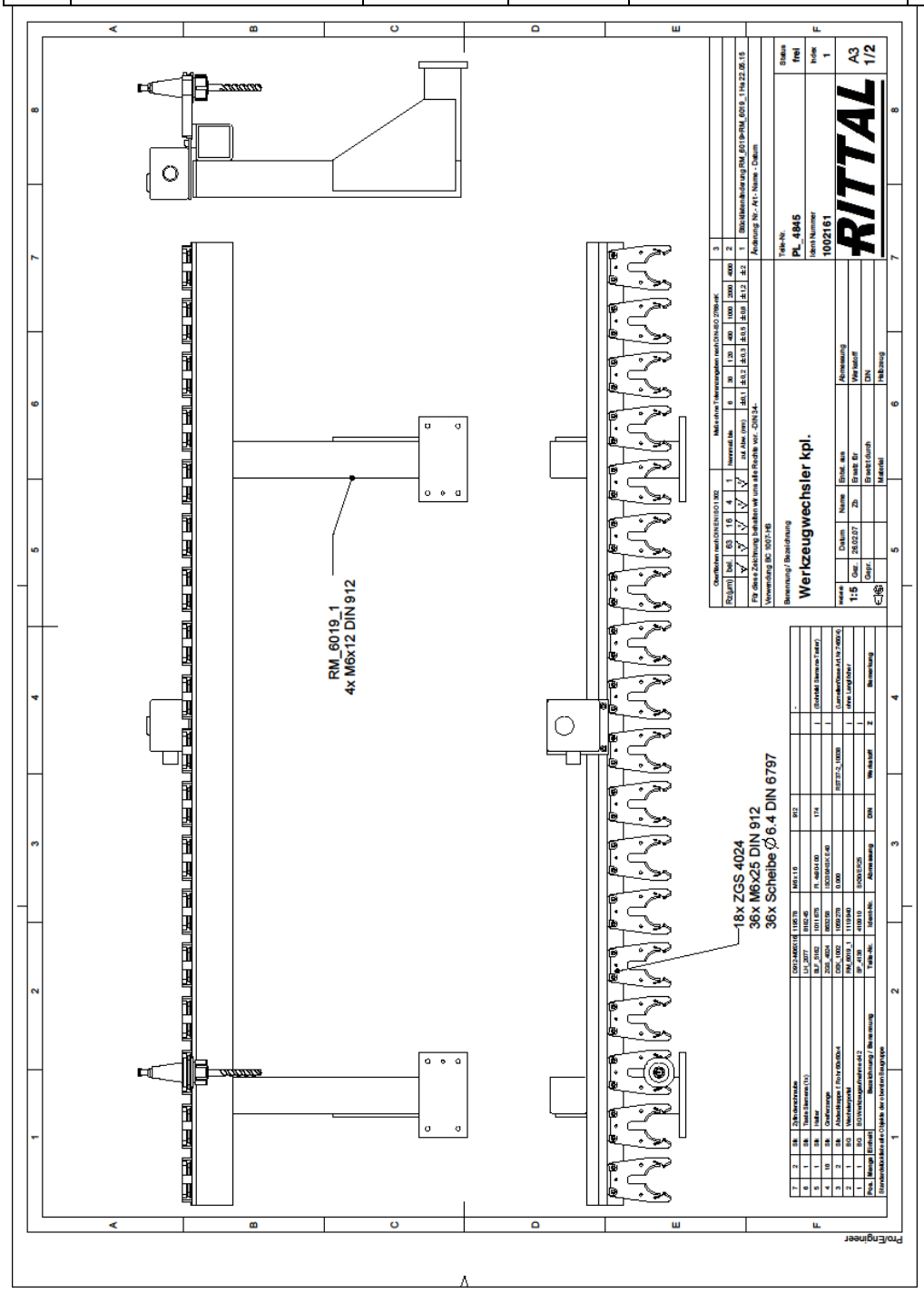


Chart 13: Tool changer complete

12.1.5 WP 4098 Turnbuckle 1003672

1	Z-profile	BLF 4912	189100	4 thick	1541	St12ZE
1	Rubber slip joint	SLA 300002	219030	75mm long		
1	Slotted screw	YR 4008	1003680			
1	Rubber sleeve	GUT_1000	284 810	9/14/18-3 (GUT 313)		soft-PVC
1	Eccentric lever	HB 4400	1003698	04232-201108		steel

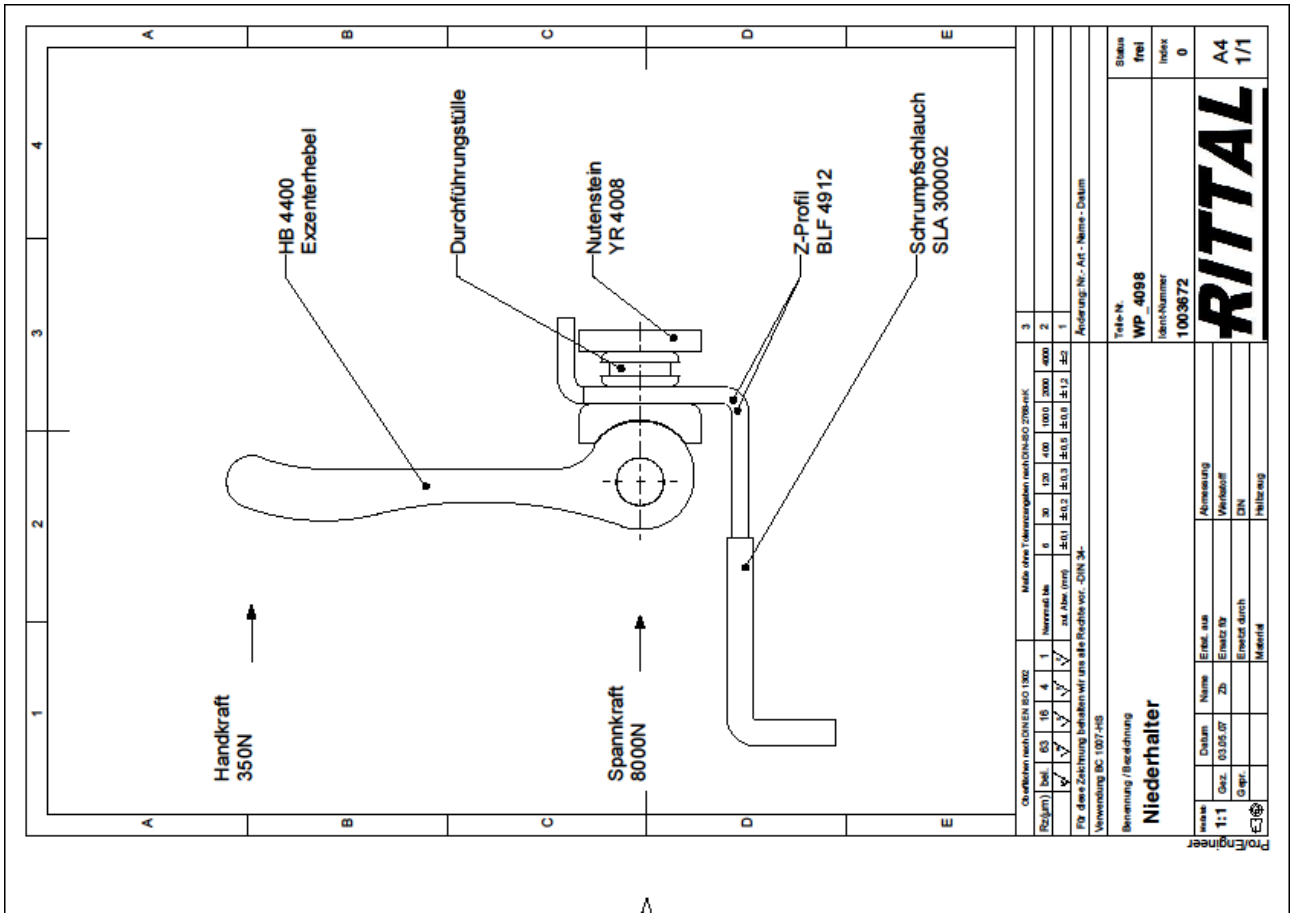


Chart 14: Turnbuckle

12.1.6 WP 4097-1 Turnbuckle complete 1065713

6	Shift rail	FHS 5180	1065671	24x10x13x2 1640 lg.		St12
1	Shift rail	FHS 4925	1002385	24x10x13x2 1190 lg.		St12
11	Turnbuckle	WP 4098	1003672			
34	Counter sunk screw		122 572	M6x12	7991	

12.1.7 LA 4358 Pressure device 1125442

2	Guide shaft	BZA 4725	873984	∅20x160	668	9S20k
2	Cylinder head screw		124 446	M8x25	7984	
1	Fastening plate	PLE 6276	1027200	12x130x200	174	St37k
1	Flange	ROE 4321	1027218	∅107x75	668	9S20k
4	Cylinder head screw		119 511	M5x25	912	
1	Suction bonnet	BLF 5143	1011154	1.5 thick	1543	St12ZE
2	Cylinder head screw allen.		120 121	M5x10	912	8.8
4	Guide roller	RLL 4115	354233	∅ 40		PUR
2	Bearing pin	BZA 4681	736348	∅8x140	668	9S20k
8	Shim ring		234 625	∅8x∅14/0.3	988	
4	Locking ring		116 400	A8x0.8	471	
6	Clamping sleeve	BZA 4747	91850	D14x10	668	9S20K
6	Counter-sunk screw		326 413	M5x16	7991	
1	Rubber seal	GUP 4092	97238	∅80x∅60/20		rubber
2	Cylinder head screw		119 602	M6x20	912	
2	Hexagonal nut		122 101	M6	934	
2	Special nut	YBE 4027	672170			
2	Cylinder head screw		326 322	M8x16	912	
1	Support	BLF_5176	1024835	Fl. 10x20 - 70	174	St.37K
3	Cylinder head screw		926 363	M5x16	933	

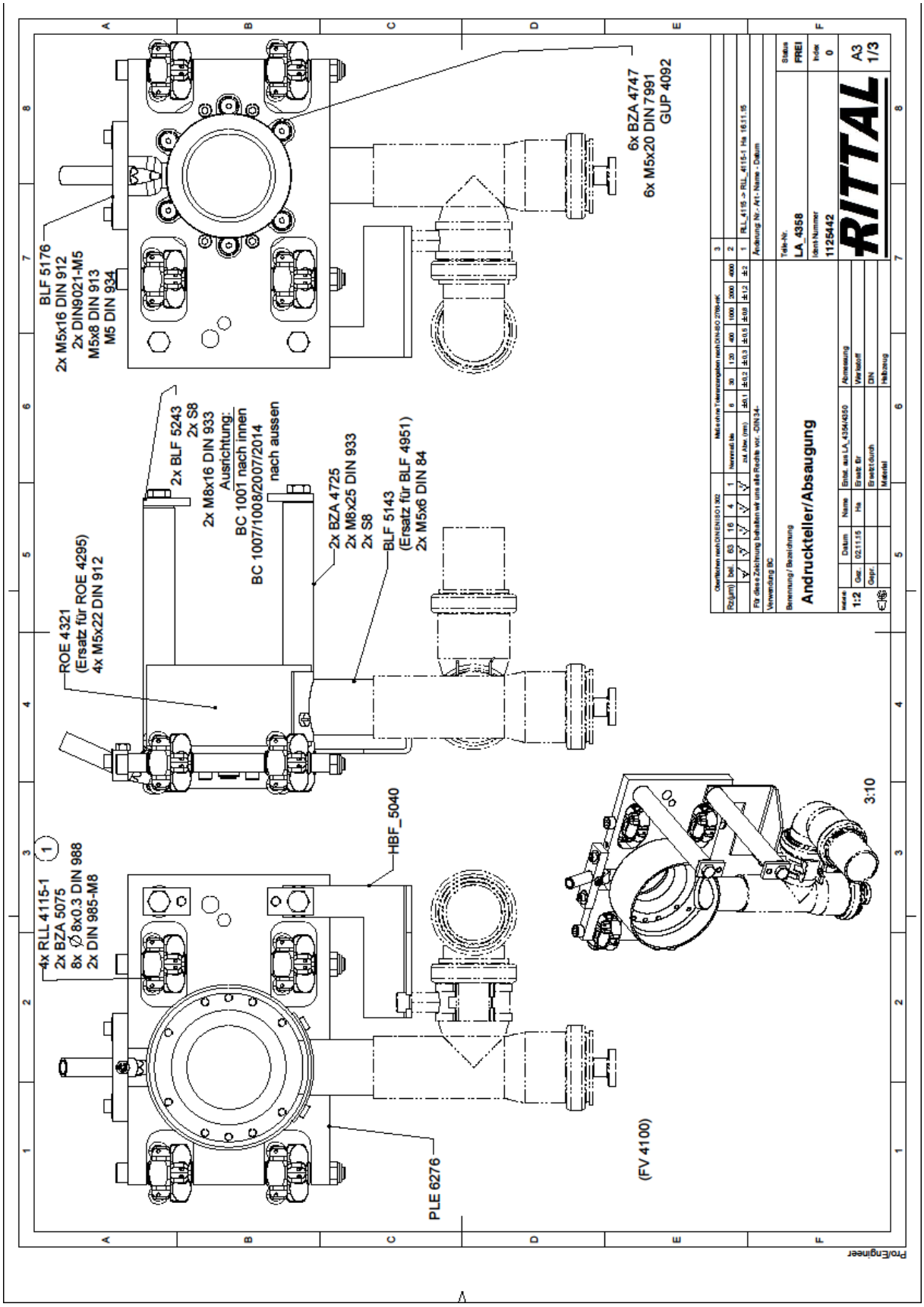


Chart 15: Pressure device

12.1.8 FV 4100 Suction device 1071976

1	HTEA – branch-off	1071992	DN 40/40 87 degrees		
1	HTB - bend	1071984	DN 40 87 degrees		
1	HTM – socket plug	1072008	DN 40		
1	HTEM - tube	838699	DN 40 L=90 mm		
1	Joint tube clamp (HT40)	667 709	40-43mm		
1	Cylinder screw	39719	M8x16	912	
1	Angle BLF 5040	364240	Thick 4mm		steel plate
1	Knurled head screw	116 202	M6x12	464	
1	Hexagon nut	122 101	M6	934	

12.1.9 SZ 4690-2 Safety fence left, complete 1032531

1	Protective grid	RM 6115	1076900	Alternat for RM 5496		
1	Intermediate plate	BLF 5119	1003482	1.5 thick	1541	St.12ZE
4	Cylinder head screw with inner hexagon		119 651	M6x40	912	
4	Hex nut		122 101	M6	934	
8	Schnorr-washer		17 459	S6		
12	Terminal block	SP 4158	1032838	Art. no. D7256		
1	Pane	SBE 4024	1032846	1695x660x5		Makrolon
3	Distance sleeve	SZ 4630	8946			
6	Cylinder head screw		120 592	M8x20	933	
6	Cylinder head screw		120 659	M8x40	933	
6	Hex nut		122 119	M8	934	
1	Base	FUS 1000	1058395	Catalogue - no. FJGN 10-		

12.1.10 SZ 4676 Safety fence upper side, complete 1003565

1	Cover	BLF 5116	1003607	Thick 1.5mm		St. plate
1	Cover	BLF 5117	1003599	Thick 1.5mm		St. plate
1	Cover plate	BLF 5121	1003581	Thick 1,5mm		St. plate
18	Cylinder head screw		119 578	M6x16	912	
6	Cylinder head screw		119 602	M6x20	912	
6	Nut		122 101	M6	934	

12.1.11 SZ 4691-2 Safety fence right and rear, complete 1032549

1	Protective grid	RM 6115	1076900	2290x1935x25		
3	Intermediate plate	BLF 5189	1032853	10x50-120		Aluminum
6	Cylinder head screw with inner hexagon		119 750	M8x40	912	
12	Terminal block	SP 4158	1032838	Square tube 25; shim thickness 6		
1	Pane	SBE 4024	1032846	1695x660x5		Makrolon
1	Protective fence	RM 5475	1003532			
1	Protective fence	RM 6080	1071562			
1	Support	RM 5479	1003540			
6	Cylinder head screw		119 693	M6x60	912	
1	Protective fence door	RM 5464	622282	1760x750x25		
2	Counter-sunk screw		55 79	M6x60	799	
2	Cylinder head screw		39685	M6x35	912	
2	Hinge		821 785	1056 U10-B		
1	Protective fence	RM 6047	1062355	Id No 1062355		
8	Counter-sunk screw		1022532	M6x40	799	
6	Cylinder head screw		119750	M8x40	912	
1	Plate	BLF 5191	1035328	10x60x60		Aluminum
E	1xsafety switch	SCH 837	750190			
4	Cylinder head screw		492 090	M5x30	912	
2	Counter-sunk screw		119 602	M6x20	799	
1	Dowel pin	SKS 303	329680	∅5		
1	Hose fitting	SLB 307	310524			
1	Steel chain		765 248	∅2.5 t=24 b=10		
1	Installation channel		903880	2000x20x20		
20	Hex-nut		122101	M6	934	
1	Bracket	BLF 5160	1014661	120x95x3-50		St. plate
3	Cylinder head screw		119 636	M6x30	912	
5	Base	FUS 1000	1058395	Catalogue-no FJGN 10		

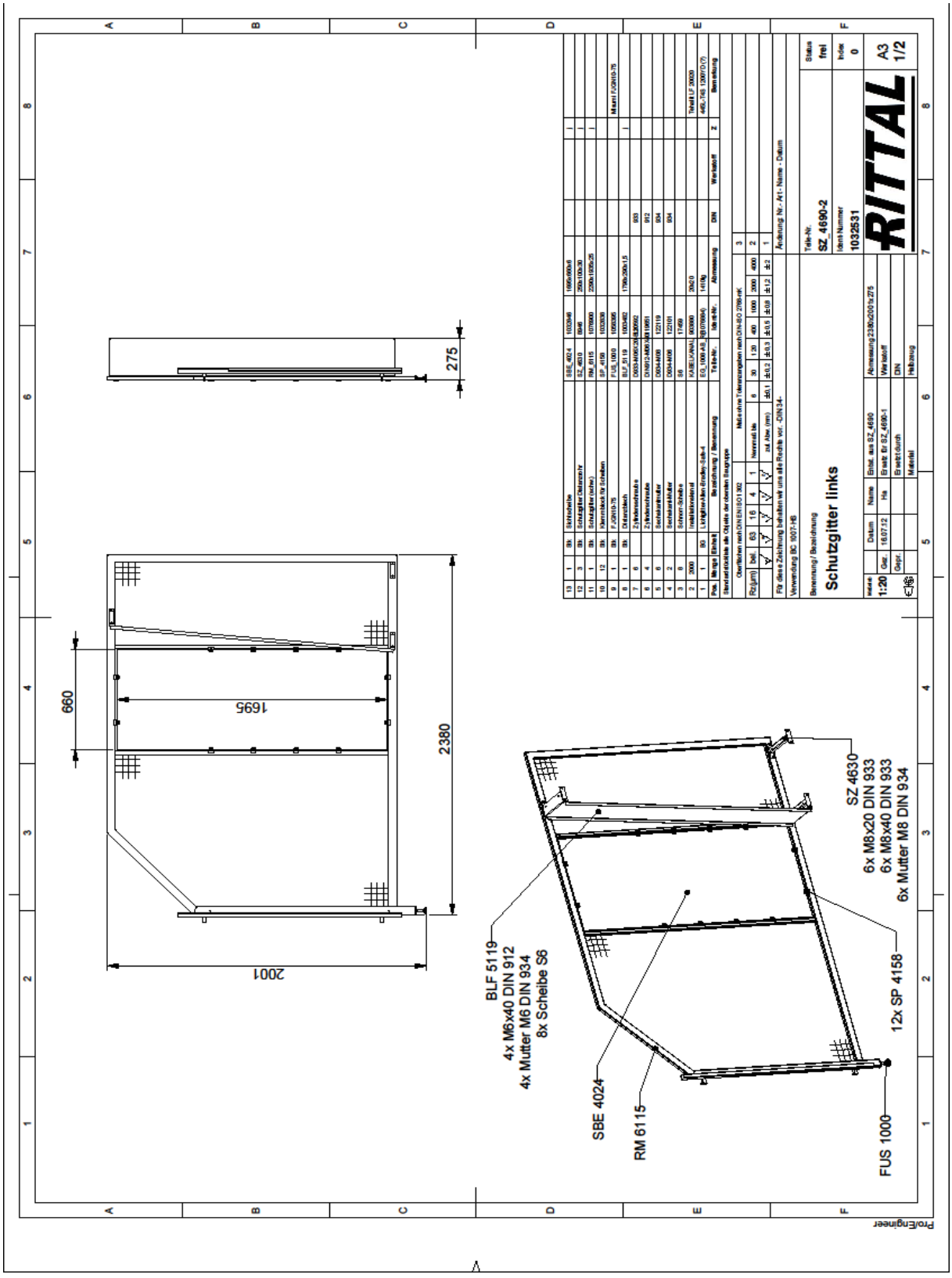


Chart 16: Safety fence left

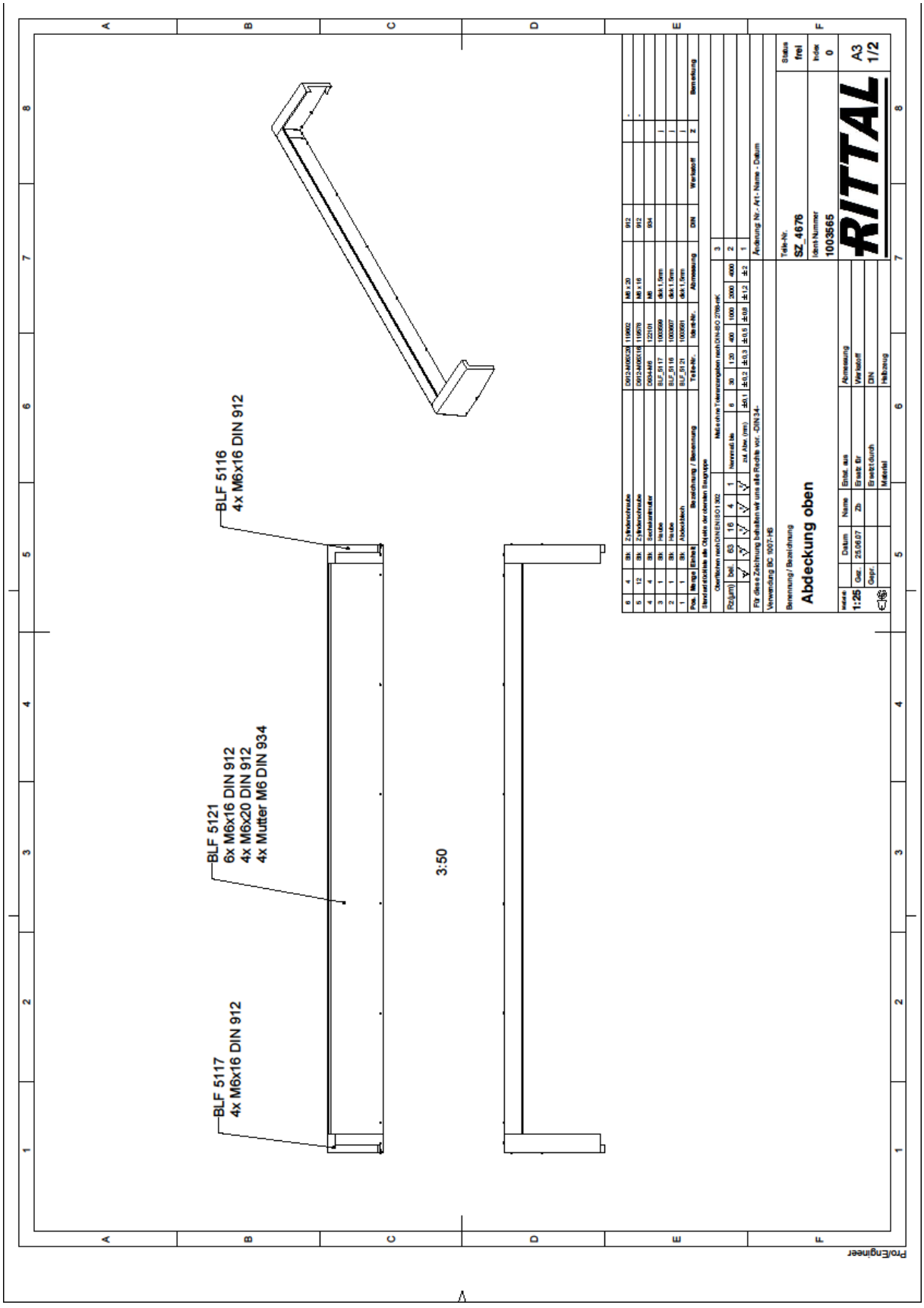


Chart 17: Safety fence upper side

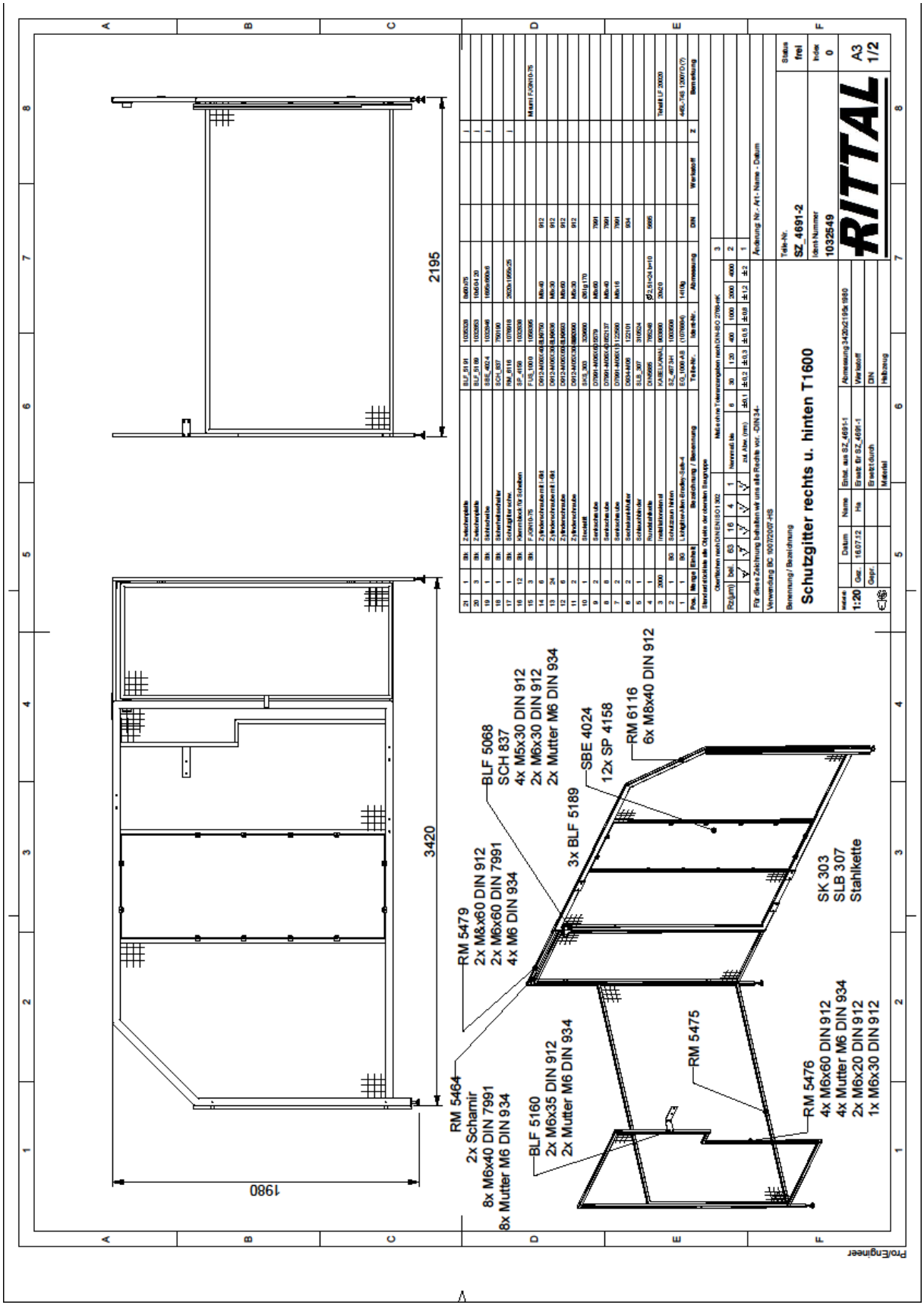


Chart 18: Safety fence right

12.1.12 WP 6036 Lower cubicle tensioning device 1071828

1	Holder	BLF 4944	553370	Fl. 8x80-100	174	St.37K
1	Holder	BLF 4945	553529	Fl. 15x40-90	174	St.37K
1	Holder	BLF 6381	1072651	Fl. 10x40-375	174	St.37K
1	Terminal strip	BLF 4946	553511	30/30x530		Aluminum
1	Terminal strip	BLF 5163	1014752	30/30x850		Aluminum
1	Slot nut	YR 4006	362277	Fl. 5x20-28	174	St.37K
2	Shim	D125-08	115 808	∅8,4	125	
1	Rocker clamp lever	HB_4403	234195	M8		
2	Cylinder screw with inner hexagon		858 843	M8x8	912	
1	Hand wheel	D6336-M08	201202	KT-40-M8-K	6336	
5	Cylinder screw with inner hexagon		119 578	M6x16	912	
1	Grub screw		651 471	M8x45	913	
1	Shift rail	FHS 4777	66449	280x12x14x2 L=640		St.12
3	Sunk screw		122 572	M6x12	7991	
	Foam rubber	GUP_5000	194233	30x30x6 pressure-sensitive		
			194233	35x40x6		
			194233	25x40x6		

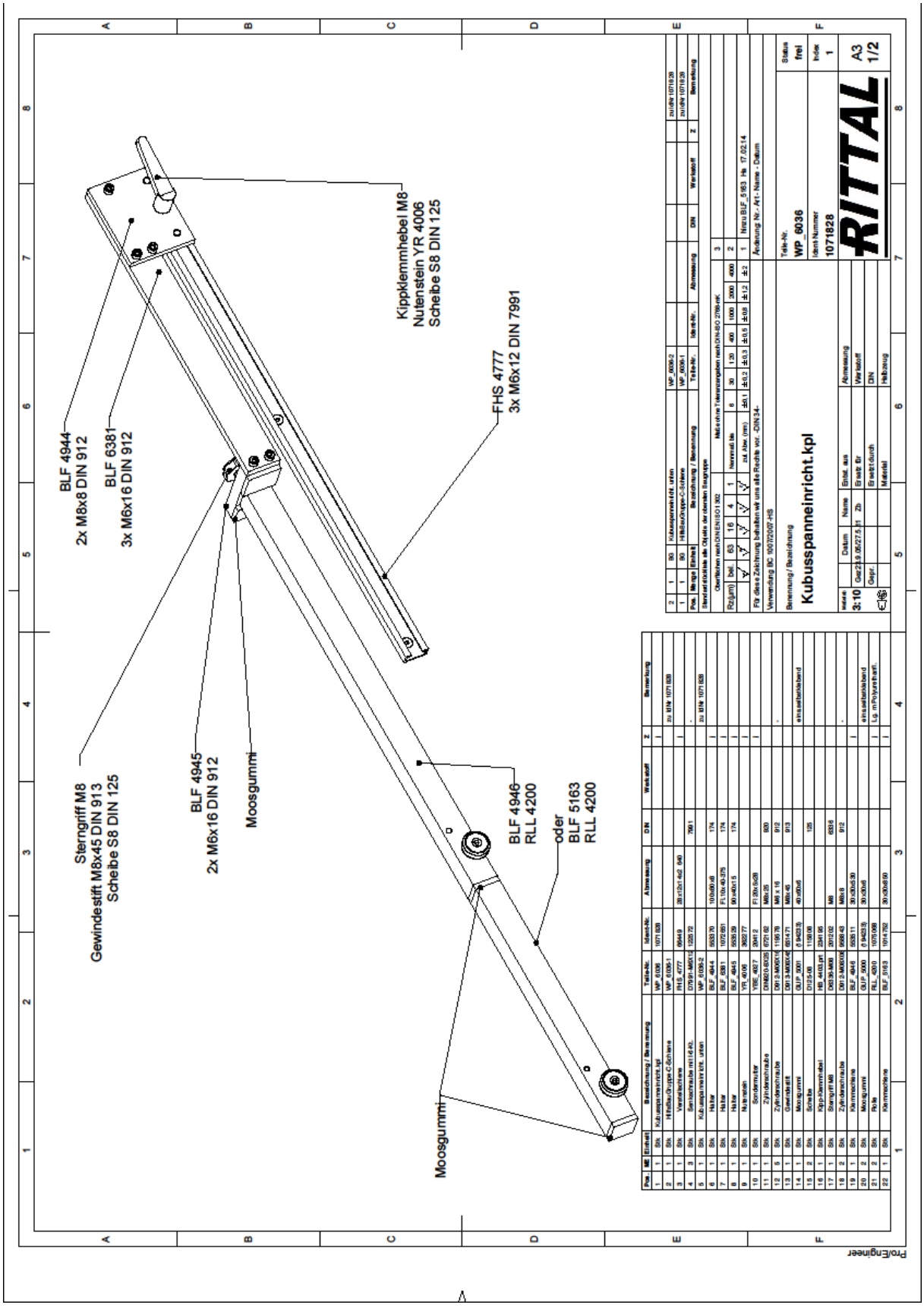


Chart 19: Cubicle tensioning device

12.1.13 WP 6022 Pneumatic work piece clamping 1071794

1	Buffer	RM 6051	1072552	9x50x75 2636	1029	St.37
11	Clamp	HBF 4669	938720	30x40x34	1017	St.37
44	Cylinder head screw with in-		119 610	M6x25	912	
22	Bushing		152 074	∅16x18x15		
11	Short stroke hoist cylinder		831 461	∅32x5 ECQ2B-		
11	Grub screw		958 553	M8x35	913	
11	Distortion lock	BLF 4629	938889	1.5x16x35.5	1543	St.12ZE
11	Hexagonal nut		122 119	M8	439	
11	Guide shaft	BZ 4028	938940			
44	Cylinder head screw with in-		492 090	M5x30	912	
11	Clamp finger	PZF 4036	938811	6x45x45	1543	St.12ZE
11	Grub screw with inner		122 622	M8x16	7991	
1	Lateral stop	BLF 6042	1060631	Fl, 15x50-60	174	St. 37K
2	Cylinder head screw with in-		119 693	M6x60	912	
4	Support	PLE 6027	102004	20x40x50	174	St.37K
10	Cylinder head screw		120 451	M6x55	933	
4	Bushing		152 058	15x17x12		
1	Push rod	BZA 5056	1072560	∅15x2400	668	St.9S20K
11	Dowel pin		123 976	∅8x36	6325	
1	Bar	HBF 4670	938761	10x20x32	1017	St.37
2	Hex socket head screw		325 449	M8x16	6912	
1	Short stroke hoist cylinder		938 563	∅32x25 ECQ2B-		
1	Cylinder support	PLE 5560	938787	10x50x45	174	St.37K
4	Cylinder head screw		938 555	M5x50	912	
1	Side lay	BLF 6196	1072578	Fl, 15x60-43	174	St. 37K
2	Cylinder head screw with in-		325 852	M6x45	912	
1	Holder	BLF 6195	1072586	20x25-84	174	St.37K
5	Cylinder pin		619 783	∅6x20	6325	
1	High knurled screw		116 244	M6x20	464	
1	Cover plate	BLF 6192	1072636	3x24-1200		Aluminum
1	Cover plate	BLF 6193	1072602	3x50-1300		Aluminum
6	Sunk screw with inner		122 531	M5x10	7991	
6	Cylinder head screw with in-		119 776	M8x50	912	

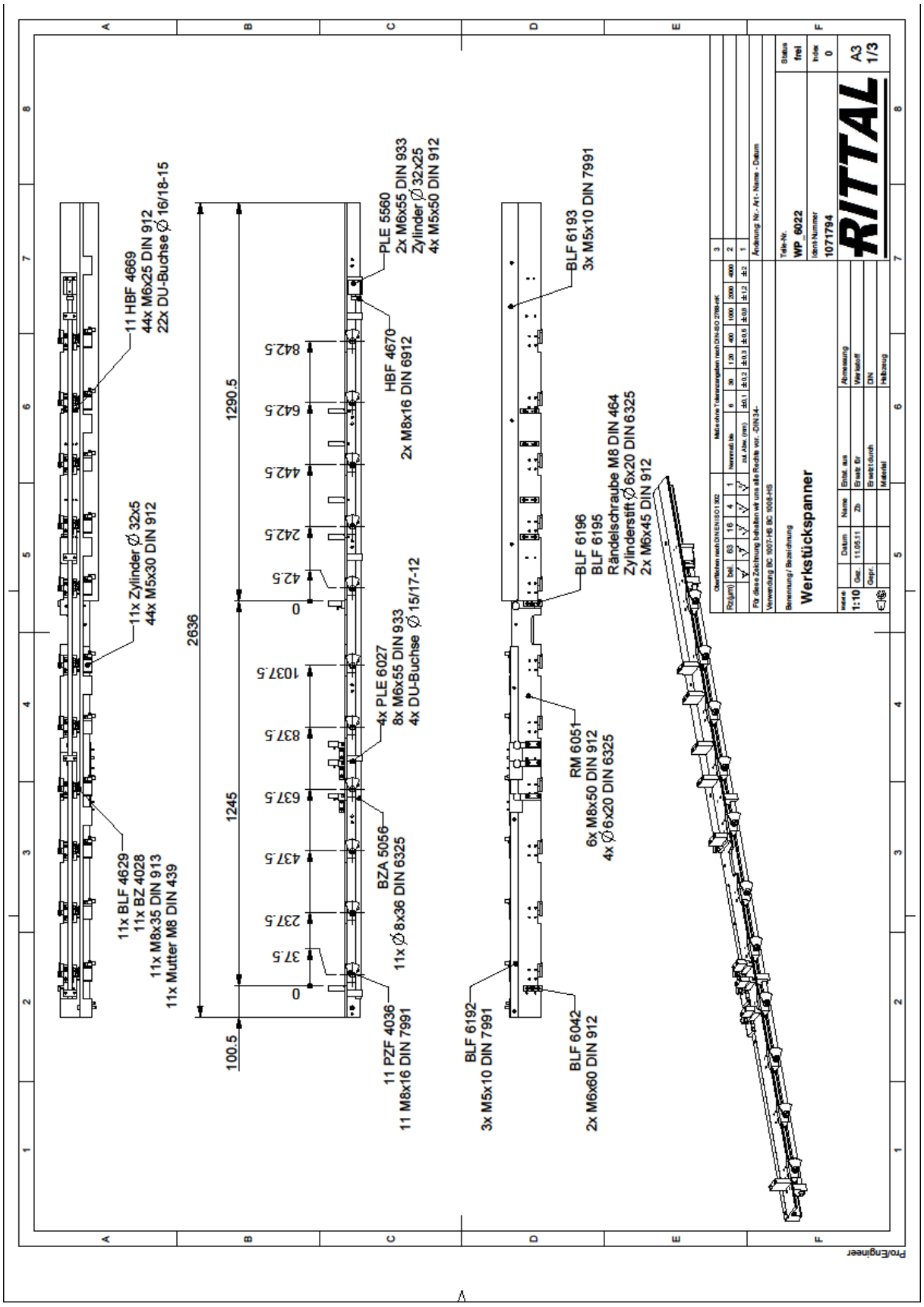


Chart 20: Work piece clamping

12.1.14 WP 4110 Cubicle clamping upfront 1032606

2	Shift rail	FHS 4973	1032671	C-rail 28x12x2-1645		
12	Sunk screw		122 556	M5x12	7991	
2	Mounting plate	BLF 5180	1032622	10x115x474		Steel plate
1	Guide rail	FHS 4968	1032648	8x74x115		St.37K
1	Guide rail	FHS 4974	1032663	8x74x115		St.37K
8	Cylinder head screw		119 578	M6x16	912	
1	Profile rail	FHS 4972	1032689	Profile 8 40x40-1736.5		
8	Slot-nut		616 124	M8		
8	Cylinder head screw		119 719	M8x20	912	
2	Cylinder head screw		119 727	M8x35	912	
2	Slot-nut	YR 4009	1032697			
2	Exzentric crank ad-justable	HB 4402	1007046	outside thread M8		
4	Pressure spring	FRD 4049	1032713	∅7,5/∅0.8 L=13		
4	Curved roller	RLL 4129	1032721	KRV22-PP-X; ∅22;		
4	Curved roller	RLL 4130	1032739	KRVE22-PP-X; ∅22-exc.		
8	Hex-nut		122135	M10x1	936	
1	Holder	BLF 5106	1001031	6mm dick		Steel plate
1	Bracket	PLE 6223	1002286	L 120x80x10-70	1029	St.37
3	Cylinder head screw		119 578	M6x16	912	
2	Cylinder pin		779 413	∅6x16	6325	
1	Star grip		201 202	KT-40-M8-K	6336	
1	Grub screw		121 848	M8x25	913	
1	Slot-nut		616 124	M8		
2	Feather key with M5	HBF 4764	477356	8x7x50	6885	
4	Sunk screw		326 413	M5x16	7991	
1	Clamp module EV	ZP 4128	1003268	EV-20/75-5		
4	Cylinder head screw		119 511	M5x25	912	
2	Cylinder pin		123 950	∅8x20	6325	
1	High knurled screw		116 202	M6x12	464	
1	Holder	BLF 5107	1001049	6mm thick		Steel plate
1	Bracket	PLE 6240	1002278	L 120x80x10-100	1029	St.37
3	Cylinder head screw		119 578	M6x16	912	
2	Cylinder pin		779 413	∅6x16	6325	
1	Star grip		201 202	KT-40-M8-K	6336	

1	Grub screw		121 848	M8x25	913	
1	Slot-nut		618 124	M8		
2	Feather key with M5	HBF 4764	477356	8x7x50	6885	
4	Sunk screw		326 413	M5x16	7991	
2	Clamp module EV	ZP 4128	1003268	EV-20/75-5		
8	Cylinder head screw		119 511	M5x25	912	
2	Cylinder pin		123 950	∅8x20	6325	
2	Cover cap		1059252	Profile 8-40x40		

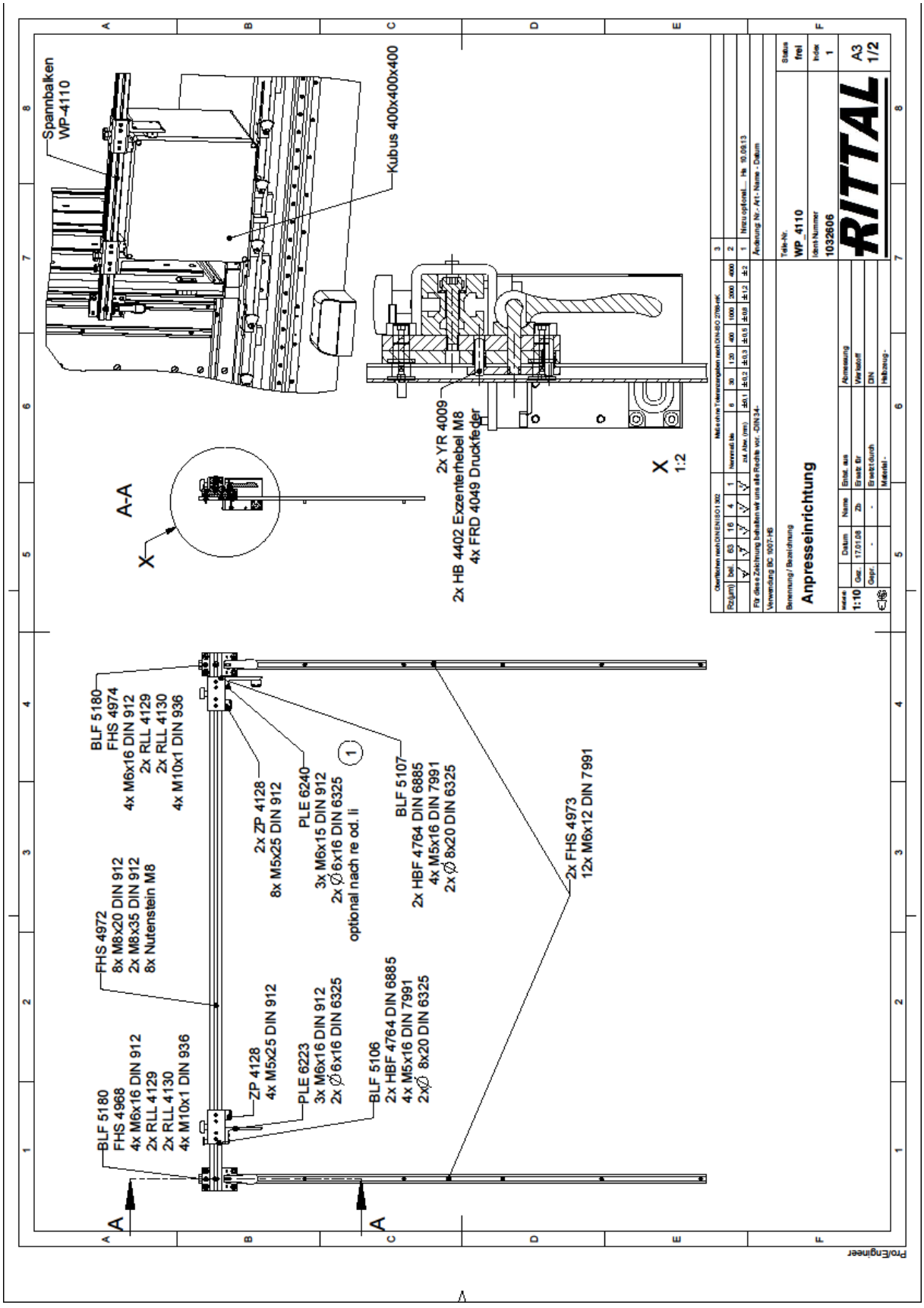


Chart 21: Cubicle clamping upfront

12.1.15 WP 6037 Motorized cubicle clamping at the rear 1071802

1	Supporting panel	HPL 5054	1072727	10x1300x1500		Pertinax
1	Buffer plate	HPL 5053	1072735	10x75x1500		Pertinax
8	Cylinder head screw		201 160	M6x40	84	
2	Cylinder head screw		325 357	M6x16	84	
5	Cylinder head screw		119 677	M6x50	912	
5	Nut		122 101	M6	934	
1	Console	RM 6079	1072743			
8	Cylinder head screw		325 449	M8x16	84	
4	Cylinder head screw		201 160	M6x40	84	
12	Grub screw		121 814	M8x10	913	
4	Dowel pin		121 863	M8x40	913	
1	Profiled rail guide	FH 4531	1036219			
58	Cylinder head screw		119 602	M6x20	912	
1	Cross member	RM 6081	1072750	Tube 80x40x4; Fl.15x60	59411	St.37
16	Cylinder head screw		119 602	M6x20	912	
1	Drive motor	EM 4232	1005669	Worm gear S002-2080D63K4		
2	Fillet	BLF 5129	1005891	Fl. 10x30 - 130	174	St.37K
2	Bracket	PLE 6235	1005883	L40x40x4 - 130	1028	St. 37
2	Cylinder head screw		228 270	M8x60	912	
2	Hex-nut		122 119	M8	934	
8	Cylinder head screw		119 610	M6x25	912	
1	Spur gear	ZRS 4130	1006014	No. 231 038 00	3967	St. C45
1	Gear rack	ZST 4085	1006006	No. 241 609 00	3967	St. 45KG
17	Cylinder head screw		119 610	M6x25	912	
2	Holder	ROE 4304	1005909			
8	Cylinder head screw		119 693	M6x60	912	
8	Hex-nut		122 101	M6	934	
2	Profile rail	FHS 4924	1005925	40x16 - 1300		Aluminum
8	Cylinder head screw		119 602	M6x20	912	
2	Plate	BLF 5112	1005917	Fl.5x40 - 150	174	St. 37K
2	Clamping device	ZP 4128	1003268	Cuboid part-no. 13291 EV20/75-5		
8	Cylinder head screw		119 511	M5x25	912	
4	High knurled screw		116 202	M6x12	464	

4	Slot nut		810 960	M6		
3	Buffer		100	No. 40.30D		
3	Slot nut		618 124	M8		
1	Cable truck	KV 4239	1014695			
1	Cable duct	BLF 5113	1005941	St. plate 3.0mm thick		St. plate
2	Distance pin	BZA 4756	1005958	SW19x235	176	St.9S20K
2	Cylinder head screw		467 399	M8x70	912	
6	Cylinder head screw		119 602	M6x20	912	
2	Hex-nut		122 101	M6	934	
4	Sunk screw		122 556	M5x12	7991	
2	End switch	SCH 838	753509			
4	Cylinder head screw		325 209	M4x20	84	
1	Holder	BLF 5164	1011840	Fl.15x40 - 170	174	St.37K
2	Hexagon head screw		120 568	M6x90	933	
2	Hex-nut		122 101	M6	934	
3	Base	FUS_1000	1058395	Catalog-no. FJGN 10-75 (M10; L=75mm)		
1	Measuring unit	SKA 5001	1072776	1600x10x1		Aluminum
1	Indicator	BLF 6382	1072768	Fl.3x20-120	174	St.37K
2	Cylinder head screw		454 173	M5x12	84	

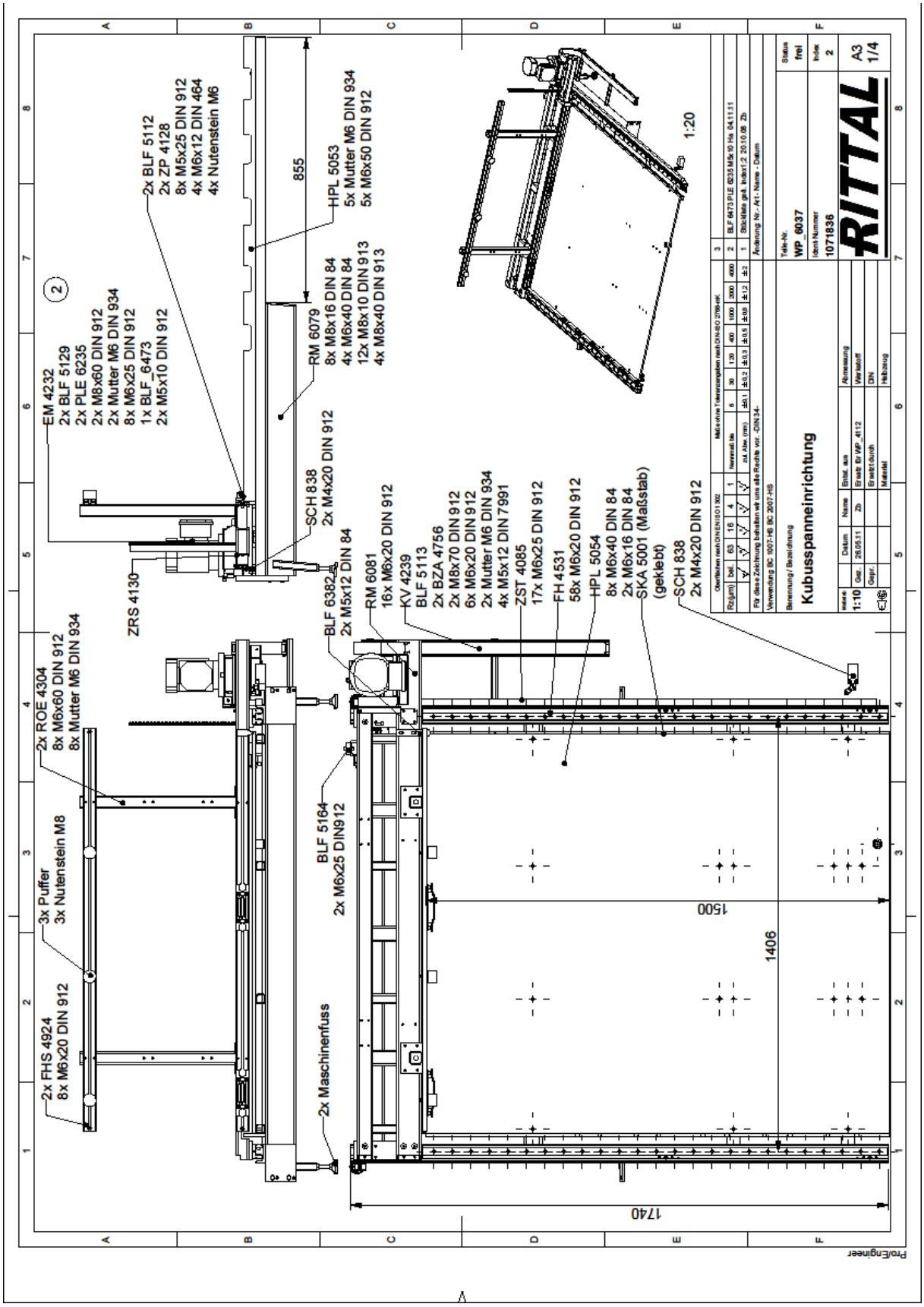


Chart 22: Cubicle clamping at the rear

12.1.16 AT 5008 Base door 1071786

1	Supporting panel	HPL 5056	1072537	1630x1160x25		Pertinax
6	Guide rail	FHS 4916	1006071	C-rail L=1480		
1	Guide rail	FHS 4959	1014638	C-rail L=1160		
41	Counter-sunk screw		122 572	M6x12	7991	
4	Plate	PLE 6263	1014646	Fl. 30x5 - 60	174	St. 37K
4	Bolt on hinge	GT_1001	41 111	60x60 (for M8 DIN 7991)		
8	Counter-sunk screw		122 622	M8x16	7991	
8	Counter-sunk screw		1023241	M8x40	7991	
1	Push rod clamp		1006113	GN841-300-AS		
4	Cylinder head screw		119 602	M6x20	912	
1	Hexagon head screw		120 618	M8x30	933	
1	Hex-nut		122 119	M8	934	
1	Cover-cap		1006113	05890-8		
1	Push rod clamp		1019637	GN842-2000-AS		
1	Bracket	RAM 5083	1019884	75x50x7 - 150	1029	St. 37
6	Cylinder head screw		326 322	M8x16	912	
3	Cylinder head screw		119 602	M6x20	912	
1	Hexagon head screw		121 350	M12x40	933	
1	Hex-nut		122 150	M12	934	
1	Cover-cap		1019637	05890-10		
	Stop pin	BZA 5044	1067222	Rd-28x50	668	St.9S29K
1	Grub screw		121 830	M8x20	913	
1	Supporting plate	BLF 6276	1067248	FL. 8x25-140	174	St. 37K
2	Cylinder head screw		325 340	M6x12	6912	
1	Bow handle	GRF 361	7203			
2	Cylinder head screw		326 322	M8x16	912	
1	Magnetic locks		103 2416	(adhesion – 23kg)		
1	Plate	BLF 5181	1028232	Fl. 5x50-70	174	St.37K
2	Cylinder head screw		119 537	M6x8	912	
3	Cylinder head screw		119 602	M6x20	912	

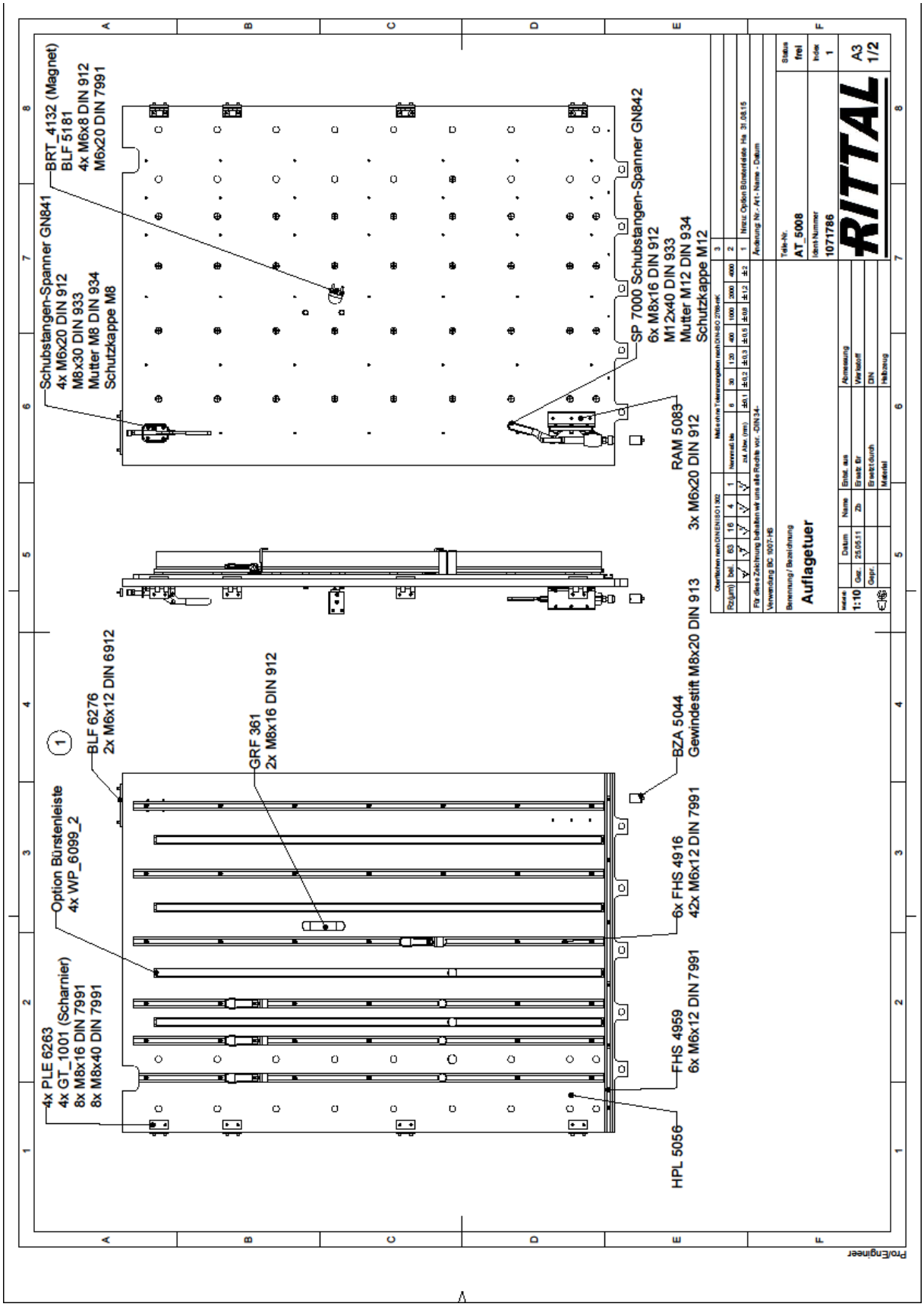


Chart 23: Base door

12.1.17 ZB 4029 Accessories 339853

1	Spanner SW24		66936	894
1	Chuck key ER25		1057082	DIV044170
1	Grease gun with extension	FP 4001	868554	4

12.1.18 SX 4010 Tool mounting kit 1008960

1	Tool mounting kit SK30	SX_4011	1008978			
1	Plate	SX_4011-2				
1	Profile rail	FHS 4949	1009018	Profile 8 40x16 - 270		aluminum
4	Cylinder head		119 511	M5x25	912	
1	Plate	RAM 5070	1009000	Fl. 10x40 - 80	174	St.37K
1	Key with M5	HBF 4764	477356	8x7x50	6885	
2	Counter-sunk screw		326 421	M5x20	7991	
1	Excentric lever	HB 4402	1007046	Kipp 04233-201108x25		
1	Slotted screw		618 124	Item 8 M8		
1	Pointer	ZGR 4022	1009026	Fl. 2x20 - 26	174	St.37K
2	Cylinder head		667 824	M4x10	84	
4	Washer		325 456	For M4	125	
3	Cylinder head		325 886	M8x35	912	
1	Steel measure	SKA 4054	1087436	sawn off: 100 – 300		
1	Stop angle	RAM 5085	1035724	L20x40x4-40		aluminum
2	Cylinder head		120 121	M5x10	912	
1	Hexagonal bolt		120 394	M6x10	933	
1	Hexagonal nut		122 101	M6	934	

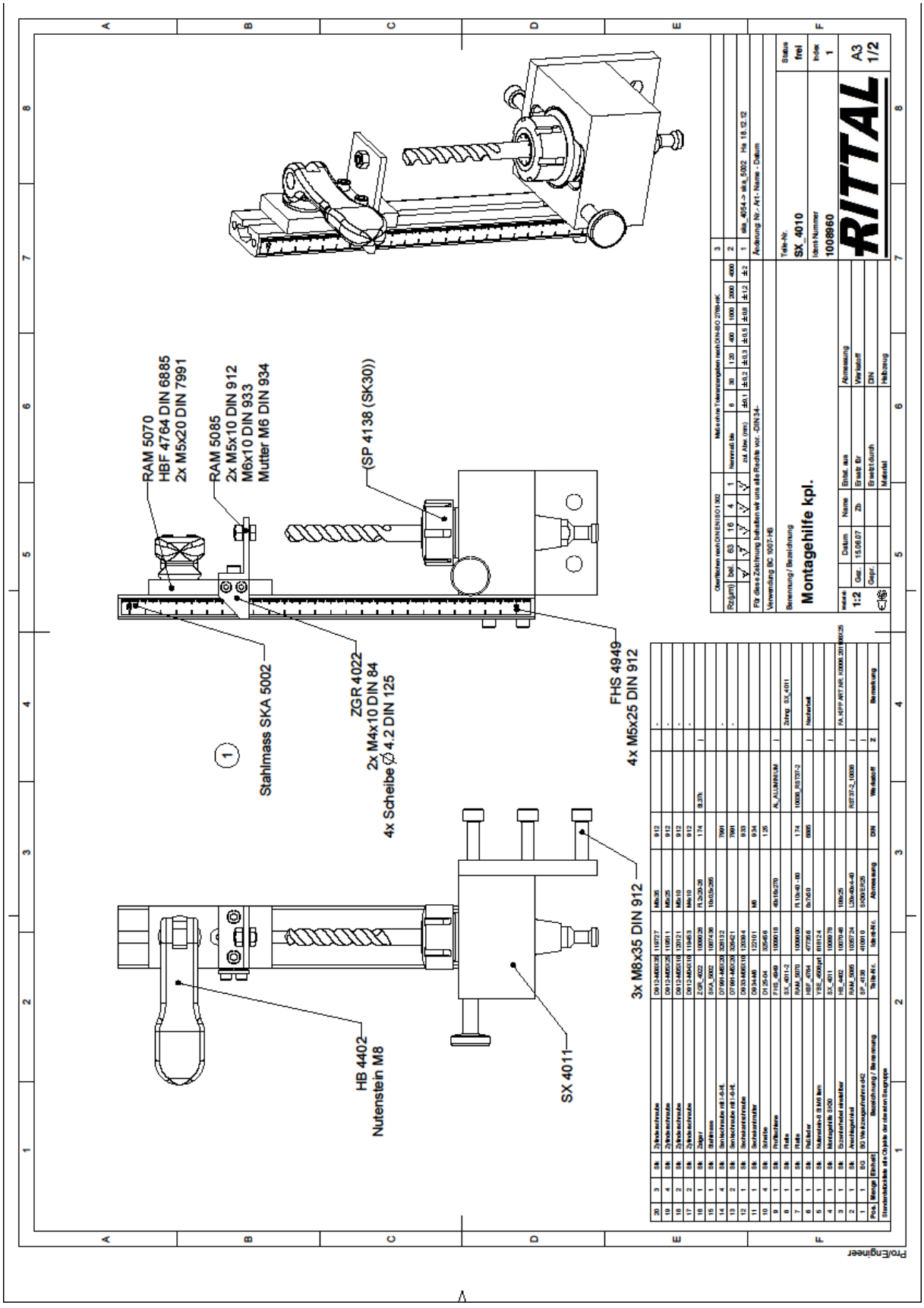


Chart 24: Tool mounting kit

12.1.19 WP 6117 Brush-Strip (Option) 1124031

4	Stop-pin	BZA_5082-1	1119809	Ø28x34	
1	Brush (50-fiber)	FRE_5006	1123876	722 mm long	
1	C-rail	FHS_5276	1124023	28x12x2-730	
4	Counter sunk screw w.i.h.	D7991-M6X16	122580		7991
1	Split-pin– spec. type/ rollpin	DIN1481	40386	Ø5-28	1481

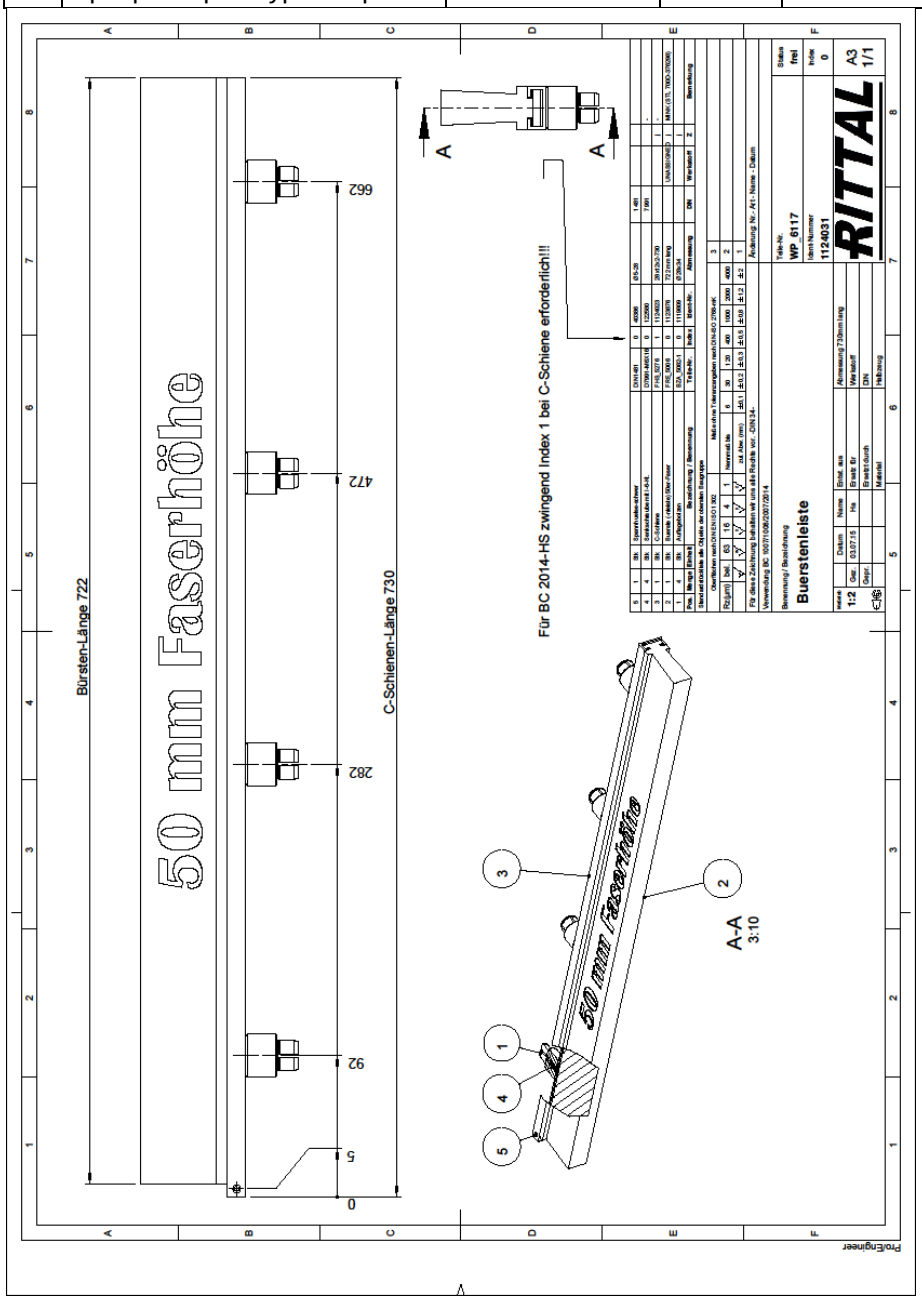


Chart 25: WP 6117 Strip

12.2 Wiring diagrams

Paper version enclosed separately; digital version see PC-drive C: \ diagrams Perforex and supplied CD (C:\Schaltpläne Perforex). Schematic no. see inside cabinet door

12.3 Pneumatic diagram

12.3.1 SE 4531 Pneumatic control elements Motorized cubicle clamping 1036862

	Group drawing	SE 4531	1036862	
1	Maintenance unit	SE 4330	779405	
1	Pneumatic control elements	SE 4525	1036904	Cross slide and pressing device
1	Pneumatic control elements	SE 4526	1036912	Work piece clamping
1	Pneumatic control elements	SE 4527	1035716	Cubicle clamping at the rear and at the front

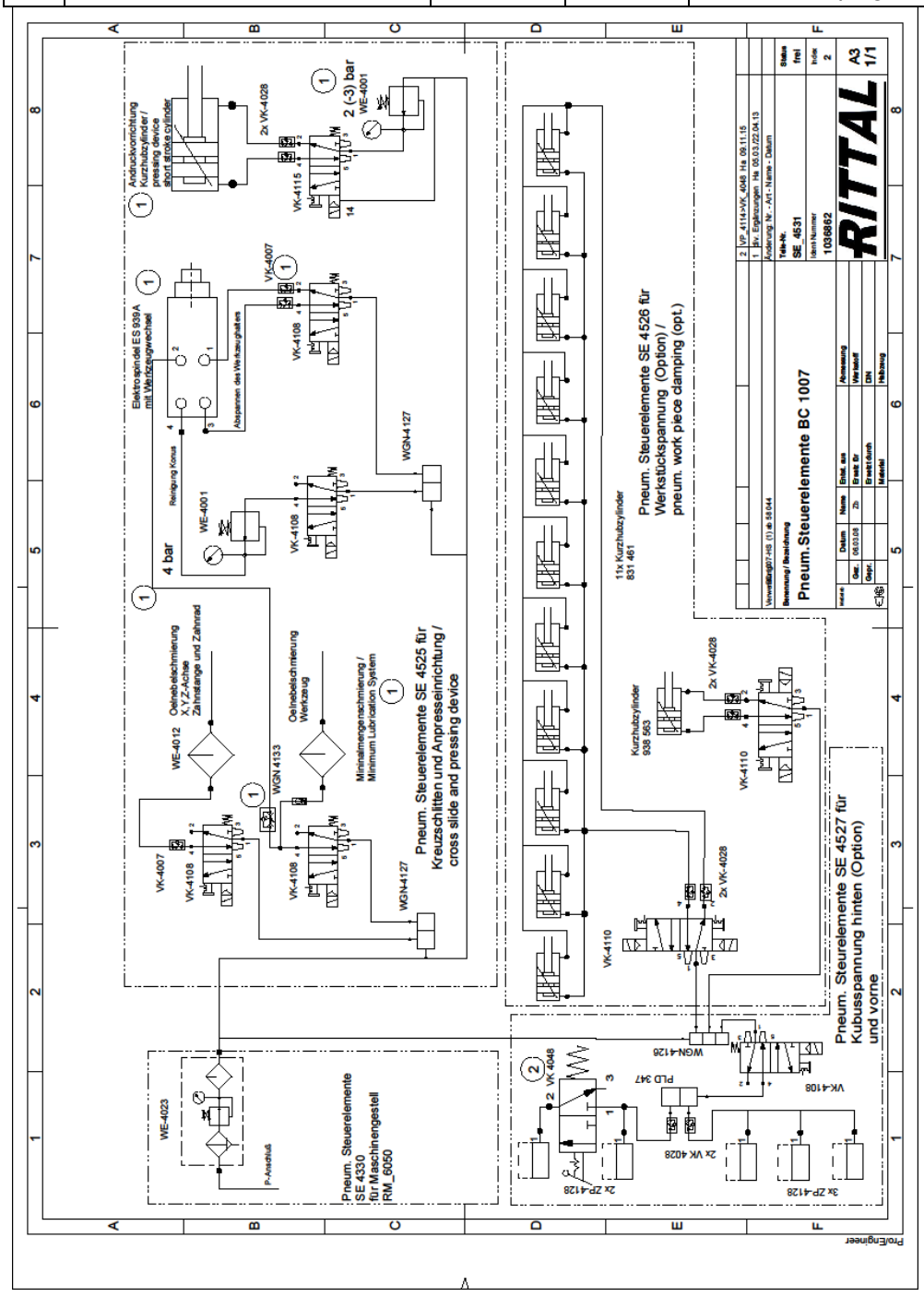


Chart 26: Pneumatic diagram

12.3.2 SE 4330 Maintenance unit 779405

1	Maintenance unit	WE 4023	1056977	G1/4 “	
1	Fastening angle	BLF 4410	673301	NL 2	
2	Cylinder head screw with inner hexagon		120 121	M5x10	912
2	Washers		325563	A 5,3	125
1	Connector	WGN 4066	766816	G1/4 “ coupling 3	
1	Socket connector	VK 4054	760553	LW 10 coupling 3	
1	Elbow screw joint	WGN 419	77875	G1/4 “	
1	Screw-fit connector straight	WGN 339	901	G1/4“ 8/6	
1	Hose socket straight	WGN 364	20040	G1/8 “	
2	Hose clip	SLB 305	323	4-12	
4m	Textile hose	SLA 322	3269	LW6x12 PVC	
1	Compressed air gun	VK 315	18986		
3	Y-plug	WGN 4051	583773	Ø8-Ø8-Ø8	
1	Reduction plug	WGN 4058	642959	Ø8-Ø6	

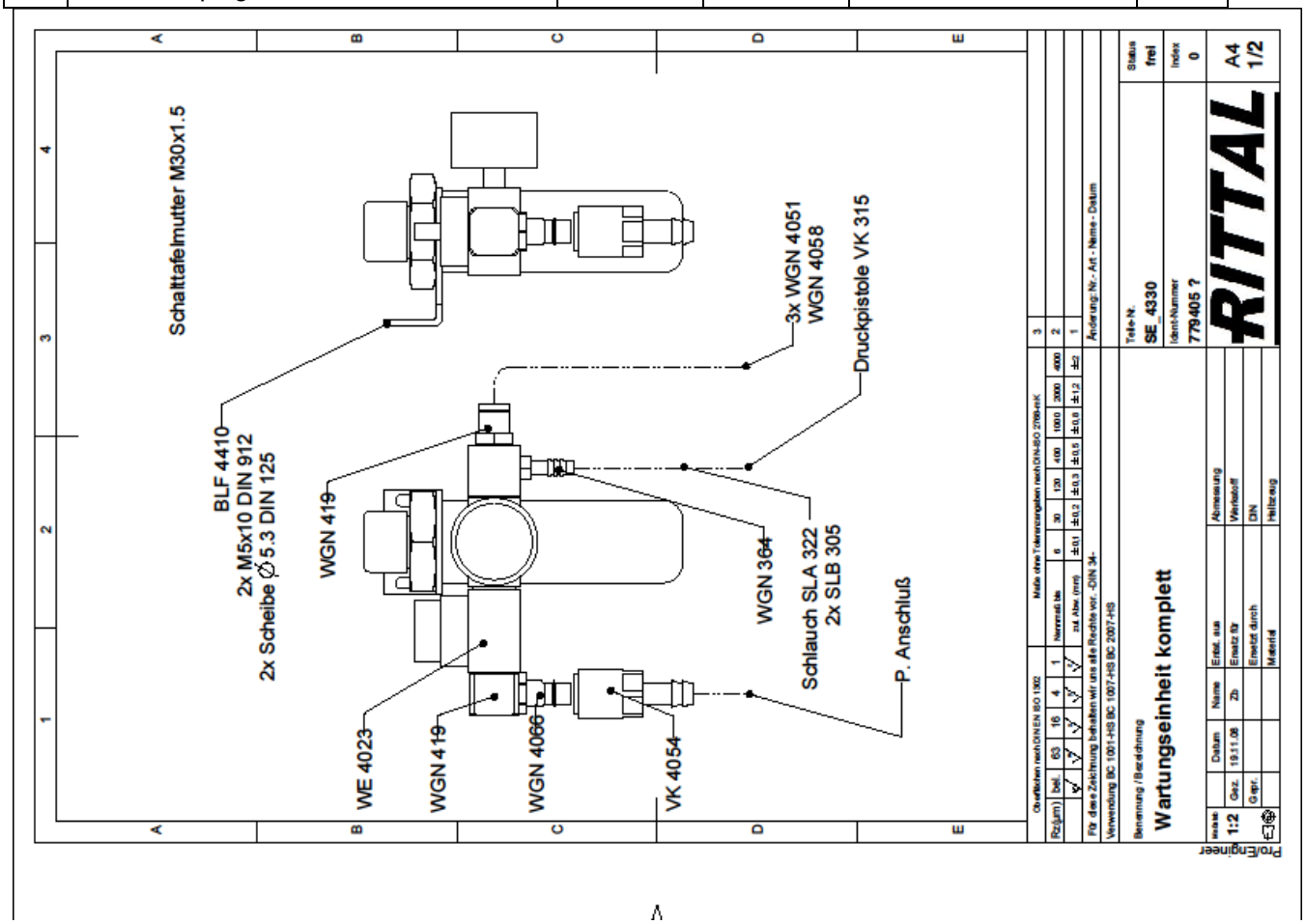


Chart 27: Maintenance unit

12.3.3 SE 4525 Cross slide and pressure unit 1036904

4	5/2-ways magnetic valves	VK 4108	430579	0 820 058 411 R1/4“; 24V;		
1	5/3-ways magnetic valves	VK 4115	1040229	0 820 058 461 R1/4“; 24V;		
2	Terminal block connector	WGN 4127	990002	20x46		aluminum
4	Banjo screw	WGN 4125	415570	no. 534-04002 K KST R1/4“;		
2	Angular threaded element	WGN 4045	568873	no. 886-0400 R1/4“; 8/6		
2	Pressure control valves	WE 4001	23432	0 821 302 400 R1/4“; with manometer		
1	Lubricator	WE 4012	947465	0 821 301 500 R1/2“; NL. 4		
2	Throttle check valves	VK 4007	20248	no. 234-0400K R1/4“; outlet throttle		
2	Throttle check valves	VK 4028	23614	no. 236-0400K R1/4“; inlet throttle		
2	Ring connector singular	WGN 463	77933	no. 834-04041 R1/4“; 6/4		
2	Ring connector singular	WGN 464	77941	no. 834-04061 R1/4“; 8/6		
1	Check valve	WGN 4133	1034735	R 412 005 574 6/6		
6	Angular threaded element	WGN 4045	568873	no. 886-0406 R1/4“; 8/6		
1	Swivel joint singular	WGN 472-F	20271	no. 835-5004 K M5; 6/4		
2	Straight threaded fitting	WGN 339-F	901	no. 828-0406 R1/4“; 8/6		
1	Ring connector double	WGN 466	569061	no. 838-04061 R1/4“; 8/6		
1	Banjo screw	WGN 453-F	77917	no. 634-0400 K R1/4“;		
0	Standardized cylinder DSNU ISO	Cyl. ∅25; stroke 50; connection axial; DSNU-25-50-PPV-MA				
1	Angular threaded element	WGN 4042	568774	no. 886-0204 R1/8“; 6/4		
1	Straight threaded fitting	WGN 398	23531	no. 828-0204 R1/8“; 6/4		
2	Ring connector singular	WGN 464-F	77941	no. 834-04061 R1/4“; 8/6		
1	Banjo screw with 2 ring connec-	WGN 392-F	77560	no. 50-0400 R1/4“; 8/6		
1	Y-connection	WGN 4051	583773	no. 675-0606 8/8/8		
6m	Compressed air hose	SLA 4008	466185	no. 03-0604 6/4		
9m	Compressed air hose	SLA 4007	466177	no. 03-0806 8/6		
		EG300004	190165			

12.3.4 SE 4526 Workpiece clamping 1036912

2	5/2-ways magnetic valves	VK 4110	1040237	No. 0 820 058 421 R1/4“; 24V; without external control
4	Throttle check valves	VK 4028	23614	No. 236-0400K R1/4“; inlet throttle
4	Ring connector singular	WGN 464	77941	No. 834-04061 R1/4“; 8/6

0	1xShort stroke hoist cylinder	938 563	938563	∅32x25	SMC	ECQ2B-32-25D
0	6xShort stroke hoist cylinder	831 461	831461	∅32x5	SMC	ECQ2B-32-5D
6	Angular threaded element	WGN 417	169789	No. 87-4950 M5;		
12	Swivel joint singular	WGN 472	20271	No. 35-5004 M5; 6/4		
2	Angular threaded element	WGN 4042	568774	No. 886-0204 R1/8“; 6/4		
2	Multiple T-connection	WGN 4046	568998	No. 1 823 391 235 6/4; 8/6		
6m	Compressed air hose	SLA 4008	466185	No. 03-0604 6/4		
3m	Compressed air hose	SLA 4007	466177	No. 03-0806 8/6		

12.3.5 SE 4527 Cubicle clamping at the rear and at the front 1035716

1	5/2-ways magnetic valves	VK 4108	430579	0 820 058 411 R1/4“; 24V; without external control	
1	Distributing connector	WGN 4126	985630	20x20x67	Aluminum
3	Banjo screw	WGN 4125	415570	No. 534-04002 K KST R1/4“;	
2	Angular threaded connection	WGN 4045	568873	No. 886-0400 R1/4“; 8/6	
	Clamping module	ZP 4128	100326	cuboid part-no. 13291 EV20/75-5	
1	Distributing block	PLD 347	20024	No. 83-01 R1/4“;	
2	Throttle check valves	VK 4028	23614	No. 236-0400K R1/4“; Throttle check valves	
2	Ring connector singular	WGN 463-F	328088	No. 834-04041 R1/4“; 6/4	
2	Multiple T-connections	WGN 4046	568998	No. 1 823 391 235 6/4; 8/6	
1	Angular threaded connection	WGN 4045	568873	No.886-0406 R1/4“; 8/6	
2	Angular threaded connection	WGN 372-F	20271	No.887-5004 M5; 6/4	
2	Screw-fit connector straight	WGN 397	169805	No.886-0406 M5; 6/4	
1	Ring connector double	WGN 4054	601237	No.839-50041 M5; 6/4	
1	Banjo screw for 1 ring connec-	WGN 4055	601245	No.635-5000-K M5; 6/4	
1	Stop-cock	VP 4114	530154	No. R 412 005 502	
3m	Compressed air hose	SLA 4007	466177	No. 03-0806 8/6	
2	Spiral hose	239 830	239830	D=72	

13 Supplier’s documentation

13.1 Minimum Lubrication System

Instruction manual
Minimum Lubrication System
M&K BASIS

Müller & Karle
Minimum Lubrication System

Großklamm 9 D-76287 Rheinstetten (Forchheim)
Germany

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Mobile: 0160 – 824 05 88

Table of contents

1 Introduction

Dear customer,

With the purchase of this minimum lubrication system M&K® BASIS you have decided to choose an economical technology protecting in the same time our environment. Our high-tec appliances have been designed for the use in modern machine tool.

If you do have hints, advices and questions regarding the operation of the appliance or in the use or improvement of this instruction manual, do not hesitate to contact our staff.

M&K

Müller & Karle
Großklamm 9
D-76287 Rheinstetten (Forchheim)
Germany
Phone + 49 (0) 0721 – 569 68 10
Fax + 49 (0) 0721 – 569 68 11
Mobile 0160 – 824 05 88

2 Security information

Before the start-up it is essential to carefully read this instruction manual!

Store this instruction manual carefully and hand it over to the following owner or user if necessary.
This MKS® BASIS is in conformity with the recognized rules in technology and the appropriate security regulations.

MKS® BASIS may only be used for lubrication on machining and conversion processes. The manufacturer is not liable for any damages caused by improper use or wrong operation of the appliance. The user of the appliance is strongly requested to respect the following advices.

- The general rules and security advices for machinery and appliances using compressed air are equally valid for M&K® BASIS and it is strongly requested to respect them.
- Do not direct spray on human beings or animals.
- Do not spray into the eyes and do not directly inhale the aerosol.
- Do not put in use damaged appliances.
- In order to secure safe operation of M&K® BASIS only install and operate the appliance according to the instruction in this manual.
- Before filling in the lubricate, disconnect M&K® BASIS from the compressed air supply and release the pressure vessel.
- In case of rupture of the appliance, immediately disconnect the appliance from the compressed air supply (open quick-release coupling).
- Repairs, exchange of spare parts as well as interventions on M&K® BASIS should only be made after having contacted our after-sales-service.
- Check before each start-up, if the compressed air connection and the regulating valves are in proper condition.
- Don't get flames or sparks near to the spray stream.
- Only use original accessories.
- Before each cleaning and maintenance of M&K® BASIS it is essential to remove the compressed air connection and to release the pressure vessel.
- Make old and worn out appliance immediately unfit for use. M&K® BASIS must then be properly disposed.

3 Start-up

3.1 Installation of M&K® BASIS

There are principally two possibilities for the installation of M&K® BASIS:

1. The appliance is screwed tight to the machine tool or fixed to a plane surface with a magnet. Take care not to fix the appliance on a spot exposed to strong oscillations or vibrations.
2. M&K® BASIS will be mounted next to the machine. Equally take care, that M&K® BASIS is fixed tight on a fixation point.

Which ever method you choose, please pay attention to the following important advices for the mounting of M&K® BASIS:

- **For a proper use, the appliance must be installed vertically.**
- Never install M&® BASIS up side-down (the operating elements must be located on top)
- For maintenance and filling up the lubricate container, M&K® BASIS should be positionned for easy access.
- Never install the appliance close to public areas and outside passage ways (alleys for fork lift trucks for example). It prevents possible damage of hose lines.
- Generally install the appliance with the nozzles being on top.

Damages caused by non conform installation of M&K® BASIS are under the sole liability of the user.

3.2 Filling up M&K® BASIS

3.2.1 Primary fill-up

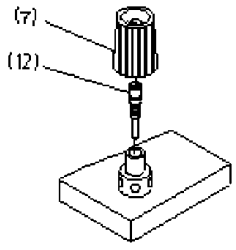
The lubricate container of M&K® BASIS has to be filled with lubricate before connecting the appliance to the compressed air circuit. Remove for that the refill tap (9) and fill the lubricate up to the maximum level located on the level indication (5). After the fill-up do not forget to screw back on the refill tap (9) before connecting the appliance to the compressed air supply!

3.2.2 Quick flooding of the conduct

For the filling of the oil pipes, sometimes several meters long, the appliance should normally be switched on for quite some time. Hence, the oil would move very slowly towards the spray nozzle. In order to speed up this procedure, the appliance has been equipped with a quick flooding device which offers the possibility to temporarily increase the oil flow. Long waiting periods for the initial start-up are prevented herewith.

Procedure:

- ✓ Release bolt in the rotary knob (7)
- ✓ Take off the rotary knob
- ✓ Open inner spindle (12) with one complete turn
- ✓ Switch on the appliance and flood the conducts
- ✓ After outflow of oil on the spray nozzle is secured, lock the inner spindle (12) up to the stop
- ✓ Put the rotary knob (7) back on and screw tight.



3.2.3 Topping up (whenver min. marking is reached)

In case the M&K® BASIS has already been in service the appliance must be made pressureless before any topping up. For this purpose disconnect the appliance from the compressed air supply and unscrew the release tap.

For security purposes release the pressure exclusively through entire separation of M&K® BASIS from the compressed air supply !

Is the appliance pressureless, then the topping up of lubricate can be done according to the description in above chapter 3.2.1

Please observe the maximum filling capacity!

- **Important:** Take care that for topping up you use the same lubricate as before. In case you want to use another lubricate as the one before, then consult the supplier in regard of compatibility of the lubricate or entirely drain the old lubricate and refill the appliance completely with the newly chosen lubricate. After that, drain the lubricate again through the drain screw located laterally on the bottom of the appliance (alan cap screw with hexagon socket) and let it drip about half an hour. The drained lubricate must then be properly disposed. You can now fill in the lubricate you use and the appliance can then be operated. No guarantee will be granted by us for damages caused by using a lubricate non compatible with the previous one without proper and thorough cleaning before, or by using aggressive or non compatible cleaning agents.

Recommended lubricate: M&K Oil 50

3.3 Compressed air connection

For the supply of compressed air, M&K® BASIS must be connected to the compressed air circuit (1).

For security reasons the air supply of the compressed air circuit should not exceed 10 bar!

Before connection to compressed air make sure that the push handle valve (2) is closed.

A connection to the compressed air circuit according to the standards may only be done by qualified personnel !
M&K® BASIS may only be used with operating pressures up to 4 bar!
In case of higher pressure, the security of man and machine will be in danger!

3.4 Control and function

M&K® BASIS is equipped with one spray nozzle. The oil flow takes place in the inner capillary of the nozzle conduct hose. During the start-up of M&K® BASIS it is important to notice that obtaining a sufficient quantity of lubricate related to the length of the conduct to the nozzle can take several minutes. Sufficient quantity of lubricate is instant when switching on and off at later times. However, when the appliance has not been in use for a longer period, one has to check if a lubricating film has appeared on the tool before starting another machining job.
The oil quantity can be individually and separately adjusted with the rotary knob (5) for fine regulation min. and max. Notice herefore the control imprint on the control block.
With the valve (4) for pressure regulation on the oil column and over the manometer (6) one can adjust the range in which the appliance should operate. The jacket air can be regulated through the throttle valve (3), besides the same valve can also be considered as main air throttle. You can read the lubricate quantity, which the application presently employs, from the diagram 4.3.3.

4 Operation

The adjustment of M&K® BASIS for the machining is similar to the adjustment for machining with full stream lubrication. It depends on the total process parameters like for example cutting speed, material, cutting tool, etc. and must therefore be newly determined from case to case by the machine operator.

4.1 Operating elements

Das M&K® BASIS offers the following possibilities for adjustment:

- Oil quantity regulation (fine) in the capillary hose through the rotary knob (7)
- Regulating valve (4) for the pressure on the oil column (i.e.. pre-adjustment of the range in which the appliance should operate)
- Main air valve (2)
- Throttle valve (3) for the jacket air

4.2 Basic adjustment

The first and basic adjustment has been made through the company M&K. In case the appliance must be basically adjusted again, then please follow the procedure hereafter:

1. Connect the appliance to the compressed air supply (1).
2. Turn the regulating valve (4) until the manometer (6) shows 1.0 bar
3. Adjust the rotating knob (7) on the neutral position between markings min. and max.

As from now on you can individually adapt the adjustment of regulators (4) and (7) to their kind of machining. The position of the screw (3) is normally not modified during the job, unless the user wants to lower the main pressure/jacket pressure in order to reduce the noice level. But in this case take care that the necessary quantity of aerosol for the machining ist still available.

Notice: After adjustment of the throttle valve of the jacket air the appliance needs several seconds to synchronize the oil supply to the new jacket air regulation.

4.3 Exterior lubrication

Direct the nozzle to the work piece according to the machining to be done. Direct the spray stream towards the tool's cutting edge in a way that this cutting edge can sufficiently be moistened.

Adjust the quantity of aerosol to the machining process similar to full stream lubrication, where criterias like lubricate, cutting parameter, attained surface roughness and tool wear determine the modification in adjustment.

4.3.1 Example milling, drilling

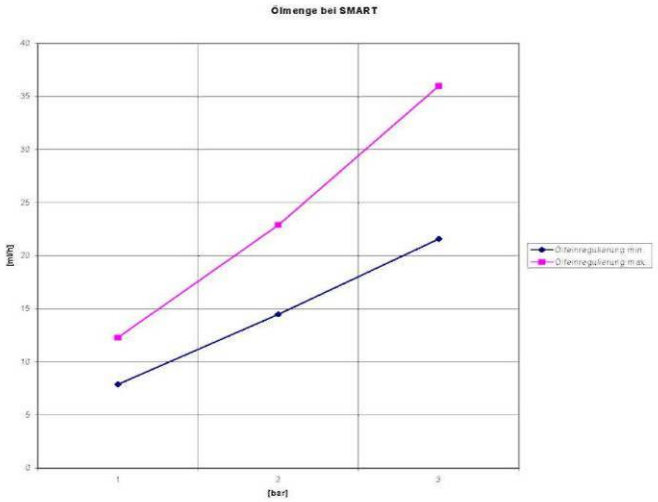
The procedure for the adjustment of lubrication is similar to the lubrication with full stream lubrication.

1. Direct the spray stream towards the machining area.
2. Check if a lubricating oil film is appearing on the present tool.
3. Adjust the quantity of lubricate according to the machining process, as described above.

4.3.2 Important notice on exterior lubrication

Should the distance between the machining area and the nozzle be too large for the standard adjustment, then the area of operation will not be sufficiently supplied with lubricate. The distance between the nozzle and the machined area should be kept as short as possible.

The larger the distance, the larger the effectiveness of the nozzle!



4.3.3 Lubricate quantity in dependence to the adjustments

5. Maintenance

5.1 Outside cleaning

Impurification on appliances in the surroundings of machining industries cannot be avoided. To clean M&K® BASIS, it must be disconnected from the compressed air supply. Then wipe the appliance with a moist cloth. Do not use a wire mesh. Do not hold the appliance under running water and do not immerse it in to a receptacle, otherwise cleansing agents could enter into the appliance which automatically would involve an inside cleaning.

Do not use aggressive or abrasive cleansing agents. After the cleaning, dry M&K® with a soft cloth and fix it again at its place of destination. Prior to reconnecting M&K® BASIS to the compressed air supply, make sure that all other connections have been fitted. It is absolutely essential to follow the recommendations and security advices in chapter 3 “Start-up”. The appliance must normally be readjusted after each cleaning. Follow hereto the recommendation in chapter 3 und 4.

5.2 Inside cleaning

Under normal application and in using lubricates which are compatible amongst each other, the inside cleaning of M&K® BASIS will not become necessary. However, if you feel that an inside cleaning will be necessary after all, then please consult our service department.

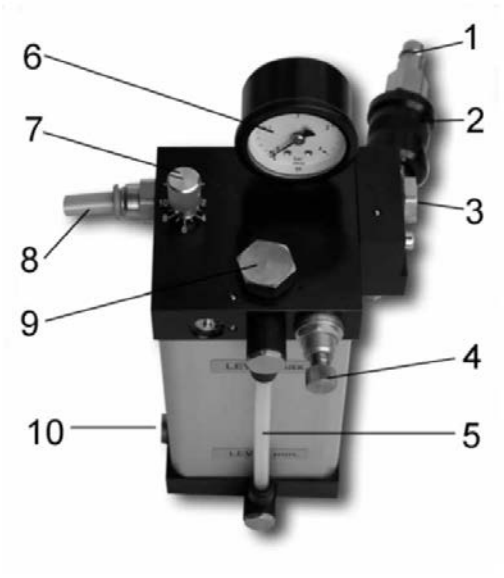
6 Guarantee

We assure guarantee on this M&K® minimum lubrication system according to the following conditions:

- We remove free of charge damages or failures on M&K® – in industrial use and single shift or similar to that within 12 months – where the fault is proven factory-provided and where we are instantly notified after detection within 12 months after delivery. The guarantee does not include easy breakable parts like for example glass or plastic. Guarantee duty does not occur in the case of slight tolerances from the nominal structure which appear unimportant in point of view value of the appliance or its fitness for use, for damages caused through chemical or electrochemical influence, through water as well as generally through abnormal environment conditions.
- Accepted guarantee claims are dealt with in a way, that defective parts are being repared free of charge or replaced by unobjectionable parts. Any recondition on site can only be requested for stationary employed (fixed base) large appliances. Other appliances, for which guarantee request is claimed, are to be forwarded to our nearest after-sales service point or contractual workshop. Copy of invoice or delivery note must be provided together with the defective part. Replaced parts do become our property again.
- The guarantee claim becomes void, if repairs or interventions are being done by unauthorized personnel or if our appliances are fitted with supplementary parts or accessories which obviously do not match with our appliances.
- Further or other claims, especially claims for occured damages exterior to the appliance will be rejected, unless liability is being enforced by law.
- Further or other claims, especially those regarding damages causing loss of production will equally be rejected.

7 Parts on M&K® BASIS

1	Compressed air connection
2	Push handle valve (main air valve)
3	Throttle valve for jacket air
4	Pressure reducer (vessel pressure)
5	Level Indicator
6	Manometer
7	Rotary knob for oil quantity regulation (fine)
8	Capillary hose towards the nozzle + plug-in nipple
9	Oil refill tap
10	Oil release bolt
11	Screw for operation by hand



8 Declaration of conformity

Müller & Karle

EC – Declaration of conformity
according to the EC - machinery guide line 89/392/EWG, appendix II A

We declare herewith, that the below-mentionned appliance is in its conception and construction as well as its final execution distributed through us in conformity with the basic safety and health requirements of the EC-machinery guide line. This declaration becomes void in the case of any unauthorized modification of our appliance.

Description of the appliance:	M&K® minimum lubrication system
Application type:	M&K® BASIS
Maschinen-Nr. :	BASIS
Applied EC guide lines:	EC- machinery guide line (89 / 392 / EWG) EC- low voltage guide line (73 / 23 / EWG) EG- electromagnetic compatibility guide line (89 / 336 / EWG)
Applied harmonized standards, especially :	EN 292-1, Safety of machinery, basic principles EN 292-2, Safety of machinery, Safety requirement
Applied national standards and technical spezifications, especially:	9. GSGV, Decree to the law regarding safety on appliances VBG 4, Directives for accident prevention “electrical equipment" and accessories”

Date / Manufacturer’s signature:

Function of the signing person:

Managing Director

13.2 Vacuum cleaner

ATTIX 350-01/360-11/360-21

(GB) Contents

[1)] Option depending on model

Symbols used to mark instructions

Safety instructions marked with this symbol must be observed to prevent danger to persons.

GB

This symbol is used to mark safety instructions that must be observed to prevent damage to the vacuum cleaner and its performance.

This indicates tips and instructions to simplify work and to ensure safe operation.

1 Important safety instructions

For your own safety

Before using the vacuum cleaner, always read the operating instructions and keep them readily available.

Only allow the vacuum cleaner to be used by persons who have been trained in its use and who have been explicitly authorized to use it.

General

The use of the vacuum cleaner is subject to valid national regulations.

The vacuum cleaner is suitable for commercial use, e.g. in hotels, schools, hospitals, factories, shops, offices and rental businesses.

Besides the operating instructions and the binding accident prevention regulations valid in the country of use, observe recognized regulations for safety and proper use.

Do not use any unsafe work techniques.

Hazardous dust

This vacuum cleaner is not suitable for removing hazardous dust.

Risk of fire and explosion

The following materials should not be sucked into the vacuum cleaner:

- hot materials (burning cigarettes, hot ashes, etc.)
- flammable, explosive, aggressive liquids (e.g. petrol, solvents, acids, alkalis, etc.)
- flammable, explosive dusts (e.g. magnesium or aluminium dust, etc.)

[1] Option depending on model

ATTIX 350-01/360-11/360-21

GB

Appliance socket

Use the socket on the vacuum cleaner for the purpose defined in the operating instructions only.

Before plugging an appliance into the appliance socket:
1. Switch off the vacuum cleaner
2. Switch off the appliance to be connected.

CAUTION!
Follow the operating instructions and safety instructions for appliances connected to the appliance socket.

Transport

After sucking up water, do not tilt the cleaner or transport it in a horizontal position.

Before starting the vacuum cleaner

Before starting the vacuum cleaner, check that it is in proper condition. Plugs and couplings in power cords must at least have splash protection.

Regularly check whether the power cord is damaged or shows signs of aging.
Before using the cleaner, ensure that the cover and power cord are intact. (There is risk of electrocution if they are damaged.)

Never use the vacuum cleaner if the filter element is damaged.

During use

Do not damage the power cord (e.g. by moving over it or pulling or squeezing it).

Disconnect the power cord by pulling the plug only (do not pull or tug the power cord).

CAUTION!
Before sucking in liquids, remove the filter bag and check the performance of the floater (see section 7.2.3).
When sucking in liquids, always use a filter element or filter screen (for order number see section 9.5 "Accessories").
If foam appears, stop work immediately and empty the tank.

Maintenance and repair

CAUTION!
Always pull out the mains plug before cleaning and servicing the vacuum clea-ner.

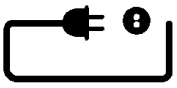
Only carry out maintenance work described in the operating instructions.

CAUTION!
Use original Alto accessories and parts only. The use of other parts can adversely affect safety.

CAUTION!
Do not make technical modifications to the vacuum cleaner.
They could endanger your safety.

For further maintenance or repair work and the replacement of a faulty power cord please contact the Alto service department or an authorized Alto workshop.

Electrical connections



Check the rated voltage of the vacuum cleaner before connecting it to the mains supply system. Ensure that the voltage shown on the rating plate corresponds to the voltage of the local mains power supply.

If you are using an extension cord, use only those specified by the manufacturer or higher quality ones (see section 9.4 "Technical data").

It is recommended that the vacuum cleaner is connected via a residual current circuit breaker. This device stops the supply of electricity if the leakage current to earth exceeds 30 mA for 30 ms or it has an earth tester circuit.

When using an extension cord, check the minimum cross-sections of the cable:

Cable length m	Cross section mm^2
up to 20	1.5
20 to 50	2.5

Arrange the electrical parts (sockets, plugs and couplings) and lay down the extension cord so that protection class is maintained.

CAUTION!
Never spray water on to the upper section of the vacuum cleaner: danger for persons, risk of short-circuiting.

Observe the latest edition of the IEC regulations.

[1] Option depending on model

2 Description

GB

2.1 Purpose

When used properly, the industrial vacuum cleaners described in these instructions are suitable for sucking up dry, non-flammable dusts and liquids.

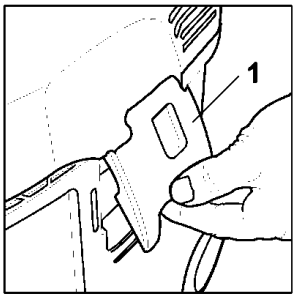
2.2 Operating elements

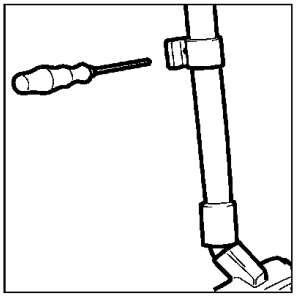
See fold-out page at front of these operating instructions.

1 Dirt tank
2 Retaining clamp
3 Appliance switch with suction power control[1)]
4 Handle with cable hook
5 Operating knob for filter cleaning[1)]
6 Appliance socket[1)]
7 Inlet fitting
8 Grip to empty tank
9 Mounting for accessories

3 Before starting

3.1 Assembling the vacuum cleaner





1. The mains plug should not yet be inserted into a socket.
2. Open the retaining clamps (1) and remove upper section of the cleaner.
3. Take the accessories[1)] out of the dirt tank and the packaging.
4. Place a filter bag into the tank as described in the instructions (printed on the filter bag).
   IMPORTANT!
   Press the filter bag connection firmly on to the inlet fitting.
5. Fit the upper section of the cleaner (do not damage the filter bag) and close the retaining clamps.
   NOTE!
   Ensure that the retaining clamps fit properly.
6. Fit the suction tube fastener about 20 cm from the edge of the lower extension tube as shown in the figure.

[1)] Option depending on model

ATTIX 350-01/360-11/360-21

GB 4 Operation

4.1 Connections
4.1.1 Connecting the suction hose

1. Connect the suction hose.

4.1.2 Electrical connection

The operating voltage shown on the rating plate must correspond to the voltage of the mains power supply.

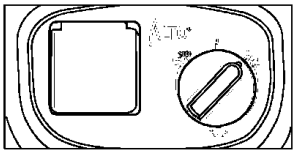
1. **Ensure that the cleaner is switched off.**
2. Insert the power cord into a properly installed and fused socket with earthing contact.

4.1.3 Connecting power tools[1)]

To comply with regulations, only approved dust producing tools should be connected.
The maximum power consumption of the connected power tool is stated in section 9.4 "Technical data".

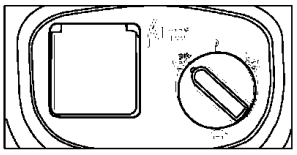
1. **Ensure that the power tool is switched off.**
2. Connect the power tool to the appliance socket[1)] on the control panel.

4.2 Switching on the vacuum cleaner
4.2.1 Switch position "I"



1. Turn the switch to position "I".
The vacuum cleaner motor starts.

4.2.2 Switch position "auto"[1)]



CAUTION!
Before switching the switch to position "auto", ensure that the power tool connected to the appliance socket is switched off.

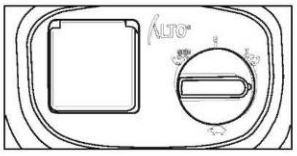
1. Turn the switch to position "auto"[1)].
The vacuum cleaner motor starts when the connected power tool is switched on.
2. When the power tool is switched off, the vacuum cleaner continues to run for a short moment so that any dust in the suction hose is conveyed to the filter bag.

[1)] Option depending on model

ATTIX 350-01/360-11/360-21

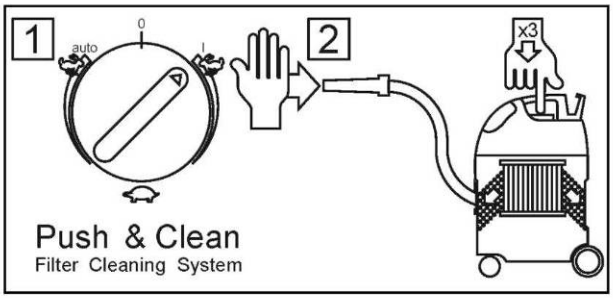
GB

4.2.3 Suction power control[1)]



The motor speed and the suction power can be varied with the suction power control[1)]. This allows precise adaptation of the suction power for different cleaning tasks.

4.3 Cleaning the filter element



If suction performance drops:

1. Close the nozzle or suction hose opening with the palm of your hand.
2. Press (3x) the operating knob for filter cleaning. The resulting stream of air removes deposited dust from the slats of the filter elements.

5 Applications and techniques

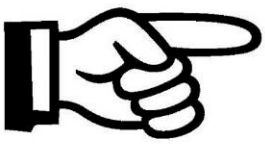
5.1 Techniques

If used correctly, additional accessories (pictures and order nos., on fold-out page at front of these operating instructions), suction nozzles and suction hoses can enhance the cleaning action and reduce the cleaning effort.

Effective cleaning is achieved if you follow just a few guidelines in combination with your own practical experience in special fields.

Here are some basic tips.

5.1.1 Picking up dry substances



CAUTION!
Do not pick up flammable substances.

Before picking up dry substances, always ensure that a filter bag is inserted in the tank (see section 9.5 "Accessories" for order number). Disposal of the picked up material is then simple and hygienic.

After picking up liquids, the filter element is wet. A damp filter element clogs more quickly when dry substances are picked up. For this reason the filter element should be washed and dried or replaced by a dry element before dry substances are picked up.

[1)] Option depending on model

7 Maintenance

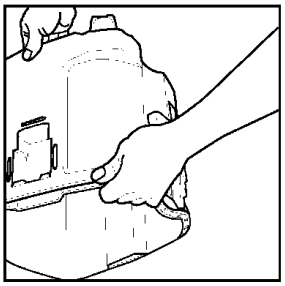
GB

7.1 Maintenance plan

	After work	As required
7.2.1 Emptying the dirt tank	●	
7.2.2 Replacing the filter bag		●
7.2.3 Replacing the filter element		●
7.2.4 Check suction hose and accessories for clogging, clean if necessary		●

7.2 Maintenance work

7.2.1 Emptying the dirt tank



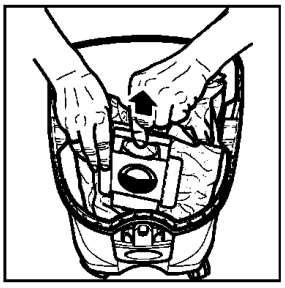
Empty the dirt tank when vacuuming without a filter bag.

1. Remove the upper section of the cleaner from the dirt tank.
2. Hold the dirt tank at the grip underneath the tank and tip out the dirt.
3. Dispose of the dirt in accordance with legal regulations.
4. Clean the rim of the tank before fitting the upper section of cleaner.

Before reinserting the suction hose:

5. Clean the inlet fitting and hose collar.

7.2.2 Replacing the filter bag



1. Remove the upper section of cleaner from the dirt tank.
2. Carefully remove the filter bag connection from the inlet fitting.
3. Close the filter bag connection with the slide.
4. Dispose of the filter bag in accordance with legal regulations.
5. Place a new filter bag into the clean tank as described in the instructions (printed on the filter bag).

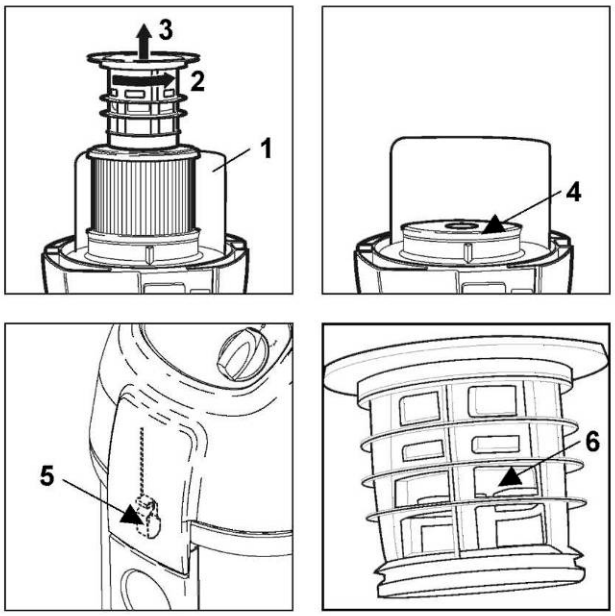
IMPORTANT!
Press the filter bag connection firmly on to the inlet fitting.

[1] Option depending on model

ATTIX 350-01/360-11/360-21

GB

7.2.3 Replacing the filter element



1. Remove the upper section of the cleaner from the dirt tank and deposit with the filter element facing upwards. Do not place the upper section of the cleaner on the guard (1).
2. Turn the filter holder anticlockwise (2) and remove it (3).
3. Carefully remove the filter element.
4. Clean the filter seal (4). Check it for damage and replace if necessary.
5. Check antistatic clamp (5) for damage and have it replaced by Alto Service if necessary.
6. Check the floater (6) for proper operation: When you turn the filter holder, the floater should move back and forth easily.
7. Fit a new filter element.
8. Fit the filter holder and turn it clockwise to secure it.
9. Dispose of the used filter element in accordance with legal regulations.

CAUTION!
Never use the vacuum cleaner without a filter.

8 Troubleshooting

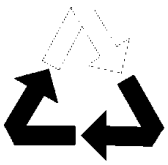
Fault	Cause	Remedy
‡ Motor does not start	> Fuse in mains plug has blown.	• Reset the fuse.
	> Overload protection switch has tripped.	• Switch off the vacuum cleaner and allow it to cool for approx. 5 minutes. If it can not be started again, contact the Alto service department.
‡ Motor does not run in automatic mode[1)]	> Power tool is defective or not connected properly.	• Check that the power tool works or that the plug is inserted correctly.

[1)] Option depending on model

Fault	Cause	Remedy
‡ Reduced suction power	> Suction power selected with suction power control[1] is to low. > Clogged suction hose/ nozzle. > Seal/tank rim between the upper section of the cleaner and the dirt tank is dirty/ defective. > Filter bag is full. > Filter element is clogged.	▪ Set suction power in accordance with section 4.2.3. "Suction power control". ▪ Clean suction hose/nozzle. ▪ Clean/replace seal. ▪ See section 7.2.2 "Replacing the filter bag". ▪ See section 4.3 "Cleaning the filter element" and 7.2.3 "Replacing the filter element".
‡ No suction power during wet cleaning	> Tank is full (floater closes the suction opening).	▪ Switch off the cleaner. Empty the tank.
‡ Voltage fluctuations	> Impedance of power supply is too high.	▪ Use a suitable extension cord (see section 9.4 "Technical data"). ▪ Connect the cleaner to another socket closer to the fuse box. Voltage fluctuations over 7 % should not occur if the impedance at the transfer point is ≤ 0.15 Ω.

9 Further information

9.1 Recycling the vacuum cleaner



Make the old cleaner unusable immediately.

1. Unplug the cleaner and cut the power cord.

The cleaner contains valuable materials that should be recycled. Therefore, make use of your local waste disposal site.

Contact your local authorities or your nearest dealer for further information.

9.2 Guarantee

Our general conditions of business are applicable with regard to the guarantee. Subject to change as a result of technical advances.

[1] Option depending on model

GB

9.3 Tests and approvals

Electrical tests must be performed in accordance with the provisions of safety regulations (VBG4) and to DIN VDE 0701 Part 1 and Part 3. In accordance with DIN VDE 0702 these tests must be performed at regular intervals and after repairs or modifications.

The vacuum cleaner has been approved in accordance with IEC/EN 60335-2-69.

9.4 Technical data

		EU	CH, DK	GB 230/240V	GB 110V
Voltage	Volt	230	230	230/240	110
Mains frequency	Hz	50/60	50/60	50/60	50/60
Power consumption	Watt	1200	1200	1200	1200
Connected load for appliance socket[1)]	Watt	2400	1100	1800	---
Total connected load/fuse	Watt/A	3600/16	2300/10	3000/13	1760/16

		ATTIX 350-01	ATTIX 360-11	ATTIX 360-21
Volume flow (air)	max. l/min.	3600	3600	3600
Vacuum	max. Pa	23000	23000	23000
Measuring surface sound pressure level measured at a distance of 1 m, ISO 3744	dB(A)	62	62	62
Operating noise	dB(A)	59	59	59
Power cord length	m	7.5	7.5	7.5
Power cord type		H05RR-F 2 x 0.75	H05RR-F 3G1.5	H05RR-F 3G1.5
Protection class		II	I	I
Type of protection (splash water protected)		IP X4	IP X4	IP X4
Radio interference suppression level		EN 55014-1	EN 55014-1	EN 55014-1
Tank volume	l	27	27	27
Width	mm	380	380	380
Depth	mm	390	390	390
Height	mm	570	570	570
Weight	kg	10	10	10

9.5 Accessories

Name	Order No.
Filter bags (pack of 5)	302 000 449
Filter element	302 000 490
Filter screen	15475
Alto Foam STOP (6 x 1l)	8469

CE

EU Declaration of Conformity

ALTO Deutschland GmbH
Guido-Oberdorfer-Straße 2-8
D-89287 Bellenberg

Product:	**Vacuum for wet and dry operation**	
Type:	ATTIX 350-01/360-11/360-21	
Description:	110/230-240 V~, 50/60 Hz, 1200 W	
The design of the appliance corresponds to the following pertinent regulations:	EC Machine Directive EC Low-voltage Directive EC EMV Directive	98/37/EG 73/23/EG 89/336/EG
Applied harmonized standards:	EN 292-1, EN 292-2 EN 60335-1 EN 60335-2-69 EN 55014-1, EN 55014-2, EN 61000-3-2	
Applied national standards and technical specifications:	DIN EN 60335-1 DIN EN 60335-2-69	

Dipl.-Ing. Wolfgang Nieuwkamp
Tests and approvals

Bellenberg, 22.04.2002

1) Option depending on model

Chart index

Table index