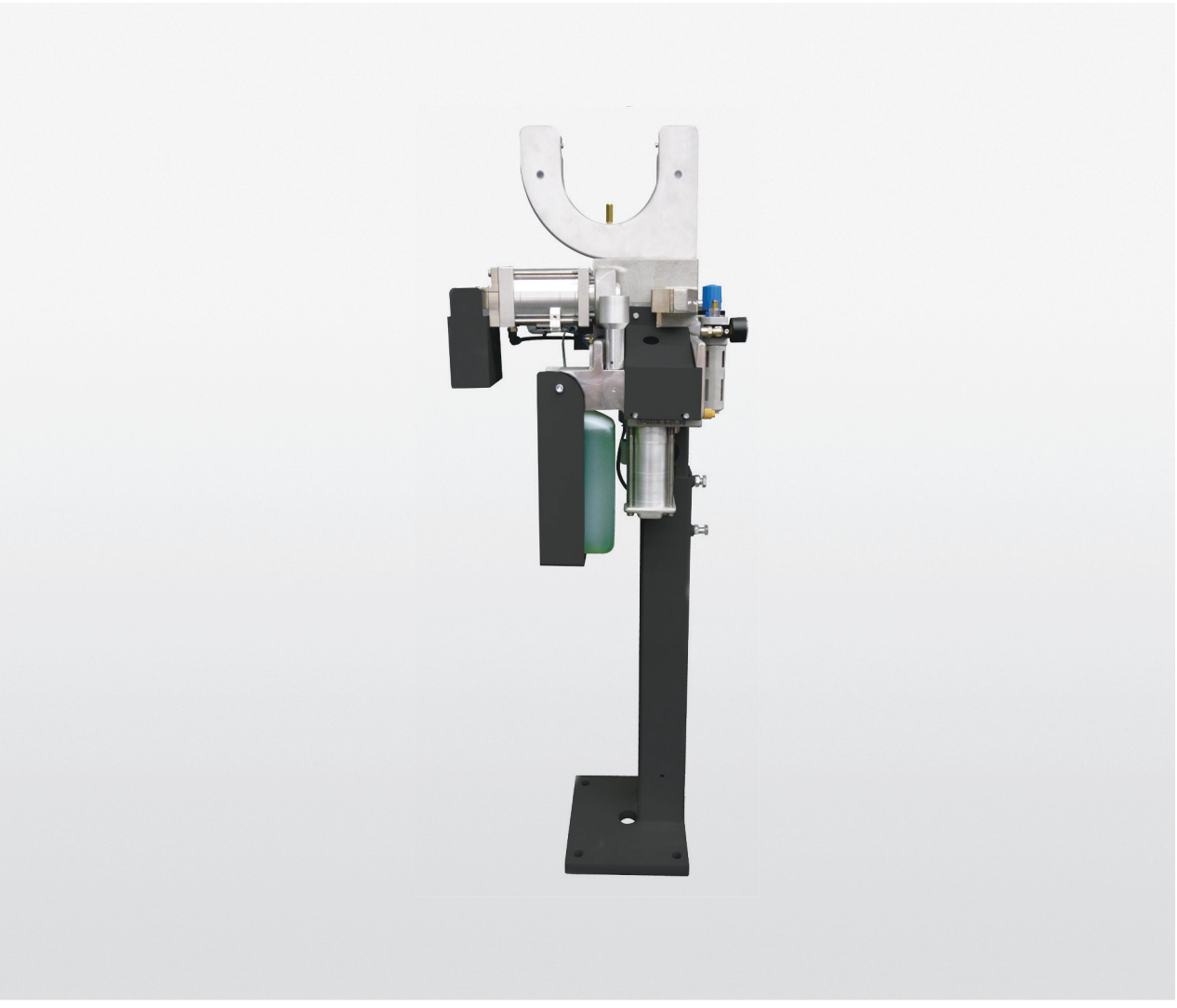
ROBOTICS

Assembly instructions

Torch Service Center TSC 2013



Document name	Document number	Language
Assembly instructions Torch Service Center TSC2013	3HDA000057A8519-003	001 (EN)

Revision	Date	Description
00	04-04-2014	1. Edition
01	20-01-2017	- New cover - Colour in the representations changed from RAL2010 to RAL7012 - Changes made in chapter: 1.6 Technical data (current, weight) 2.2 Technical data (current, weight, colour) 2.7 Maintenance (spray nozzle, milling unit, release agent tank) 5 Safety Data Sheet (Release Agent)
02	12-06-2017	Changes made in chapter: 2.2.1 TSC 2013 (new) 2.2.2 Milling cutter (new) 2.2.3 Spacer plates (new) 5.1 Dimension sheet gas nozzle (new)
03	14-06-2018	- New cover sheet and backside - Changes made in chapter: 4.8.3 EIO Configuration (new)
04	26-03-2019	- Cover page 2: Table with revision descriptions added - Font changed to ABB voice - Change in chapter 2.6: Software option changed from "653-1 ABB TC96" to "653-3 ABB TSC2013". - Supplement in chapter 3.6.3 Mounting the wire cutter: Thread locker for thread pieces added
05	24-09-2021	- Change of name to ABB AG (from 09/2021) - Declaration of incorporation new (ABB AG) - Safety data sheet AS 72-K updated

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This manual and parts thereof must not be reproduced or copied without ABB´s written permission.

Keep for future reference.

Additional copies of this manual may be obtained from ABB.

This document is the English translation of the German Original Assembly instructions.

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Assembly Instructions
Torch Service Center TSC 2013

TC 2013 / TSC 2013
Document: 3HDA000057A8519-001

Contents

Overview

These assembly instructions describe the Torch Service Center TSC 2013, the torch cleaning station TC 2013 and the add-on modules wire cutter and TCP measurement.

Please take information on each assembly from the corresponding chapter of the assembly instructions.

NOTICE

It is essential to read these assembly instructions before using the TC/TSC 2013 for the first time, to ensure safe handling of the product.

They should be read by all personnel who work with this component or with systems this component is built into.

The owner must make the assembly instructions available to the operator and make sure that the operator has read and understood them.

Safety instructions must be followed!

These assembly instructions contain information on

- the mechanical structure of the TC/TSC 2013,
- assembly,
- electrical installation,
- operation, maintenance and repair.

Use these operating instructions

- in assembly of the TC/TSC 2013 (this also includes transport),
- in setting up and connecting,
- in using for the first time.

The documents on handover correspond to the latest position at the time of first use.

Only these operating instructions are relevant for the clarification of technical issues and ordering of spare parts.

ABB does not accept liability if faults, damage, operating breakdowns and resultant production failures occur through non-compliance with these assembly instructions.

Area of use

The TC/TSC 2013 is a tool of the robot and is controlled by the robot. It is used in robotic MIG/MAG welding units

The quality, performance and functionality of the TSC 2013 are only attained if it is used in welding units designed by ABB. The TC/TSC 2013 may only be used in the intended area of use (warranty!).

ABB reserves the right to make technical modifications necessary to improve the TC/TSC 2013. Deviations from the contents or from the illustrations in these operating instructions are therefore possible.

Warranty

Warranty claims can be made in the case of

- designated use
- proper operation
- compliance with maintenance instructions
- use of genuine spare parts
- compliance with safety instructions.

NOTICE

Product liability and warranty are invalidated by unauthorised interventions and non-designated use!

The warranty covers elimination of faults and the use of parts which are shown to have become faulty or unusable due to material, design or production faults. Replaced parts become the property of the supplier.

Excluded from the warranty are

– wearing parts,
– lubricants,
– external cable connections,
– cables subjected to torsion and bending etc.

Also excluded is damage due to causes for which the manufacturer is not responsible such as

– force majeure,
– natural wear and tear,
– improper handing,
– interventions by third parties,
– excessive loading,
– unsuitable equipment and ambient conditions which do not meet ABB guide values.

In the event of malfunctions within the warranty periods the faulty item is to be sent to ABB. Notes attached by you on the fault that has occurred make it easier for our servicing department to eliminate the damage.

Target group

These assembly instructions are aimed at all persons who work on the system/machine or its components. Specialist knowledge on the operation of the system/machine is assumed for an understanding of the assembly instructions.

Establishment of areas of activity, duties and skills is the responsibility of the operator of the system/machine. It should be ensured that only qualified personnel instructed by him work on the system and its components.

Requirements

Each person working on an ABB industrial robot must be trained by ABB and have the necessary knowledge on mechanical, pneumatic and electrical work,

The robot manuals must therefore also be made available to the reader of these instructions.

Reference manuals	Document number
General safety information - IRC5	3HAC 031045-003
Safety information for emergencies - IRC5	3HAC 027098-003
Operating instructions - First steps, IRC5 and RobotStudio	3HAC 027097-003
Operating Instructions - Control IRC5 with FlexPendant	3HAC 16590-003

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1 Torch Service Center - TSC 2013

TSC means: T= Torch, S= Service, C= Center

1.1 Use

1.1.1 Designated use

The TSC 2013 is a compact, multi-functional torch service station and is used exclusively in automatic robot gas-shielded arc welding for torch cleaning, wire cutting and TCP gauging.

Intended place of installation:

In the working range of an industrial robot.

Service life:

20 years

NOTICE

Designated use also includes following all advice in the installation instructions and complying with the maintenance specifications.

1.1.2 Non-designated use

Any usage of the TC 2013 deviating from designated use is regarded as non-designated use.

The TSC 2013 must only be used in accordance with the operating conditions and performance data stipulated in the installation instructions.

Other or more extensive use or unauthorised reconstruction or modification of the TSC 2013 is deemed as not being in accordance with designated use.

NOTICE

Product liability and warranty are invalidated by unauthorised interventions and non-designated use!

1.2 Installation declaration for TC/TSC 2013

Declaration of incorporation

according to the EU Machinery Directive 2006/42/EC, Annex II 1. B
for partly completed machinery
Translation

Manufacturer

ABB AG

Grüner Weg 6

DE - 61169 Friedberg

Person established in the Community authorised to compile the relevant technical documentation

Andreas Stark

ABB AG

Grüner Weg 6

DE - 61169 Friedberg

Description and identification of the partly completed machinery

Product / Article	Torch Service Center
Type	TC/TSC 2013
Project number	2205900025_2
Order	2205900025
Model	2013
Function	Cleaning and measuring of shielding gas welding torches

It is declared that the following essential requirements of the Machinery Directive 2006/42/EC have been fulfilled:

1.1.3, 1.1.5, 1.1.7, 1.1.8, 1.3., 1.3.1, 1.3.2, 1.3.4, 1.3.7, 1.3.8, 1.3.9, 1.5.1, 1.5.3, 1.5.6, 1.5.7, 1.5.8, 1.6.1, 1.6.3, 1.6.5, 3.4, 3.4.2, 3.5.2, 3.5.3, 4.1.2.1, 4.1.2.3

It is also declared that the relevant technical documentation has been compiled in accordance with part B of Annex VII.

It is expressly declared that the partly completed machinery fulfils all relevant provisions of the following EU Directives or Regulations:

2006/42/EC	Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery, and amending Directive 95/16/EC (recast) (1) Published in L 157/24 of 09.06.2006
2014/30/EU	Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility (recast) Published in 2014/L 96/79 of 29.03.2014

Reference to the harmonised standards used, as referred to in Article 7 (2):

EN ISO 10218-2:2011	Robots and robotic devices - Safety requirements for industrial robots - Part 2: Robot systems and integration (ISO 10218-2:2011)
EN ISO 10218-1:2011	Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots (ISO 10218-1:2011)
EN ISO 12100:2010-11	Safety of machinery - General principles for design - Risk assessment and risk reduction (ISO 12100:2010)
EN 60204-1:2018	Safety of machinery - Electrical equipment of machines - Part 1: General requirements (IEC 60204-1:2016, modified)
EN ISO 13857:2019	Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs (ISO 13857:2019)

Page 1/2

Declaration of incorporation

according to the EU Machinery Directive 2006/42/EC, Annex II 1. B

for partly completed machinery

Translation

The manufacturer or his authorised representative undertake to transmit, in response to a reasoned request by the national authorities, relevant information on the partly completed machinery. This transmission takes place
electronic transfer

This does not affect the intellectual property rights!

Important note! The partly completed machinery must not be put into service until the final machinery into which it is to be incorporated has been declared in conformity with the provisions of this Directive, where appropriate.

Friedberg, 2021-09-15

Place, Date	Signature Bernd Körber Commercial Manager Robotics Division	Signature Thomas Dedecke Product Manager

1.3 Safety

1.3.1 General

WARNING

In all work on the TSC 2013 the system must be switched off and protected against being switched back on.

Higher-level instructions and directions on safety contained in the operating instructions for the welding system must be observed.

The operator of the TSC 2013 torch cleaner is responsible for the proper setting-up, installation and use of the unit, as specified by the manufacturer. The standards and safety regulations of the country concerned must be complied with.

The operator of the TSC 2013 bears responsibility for the safety precautions for personnel who work with the system or are in its vicinity.

The TSC 2013 is generally integrated into a welding robot system and connected to this by electric wiring.

Safety instructions for standing in the working range of an industrial robot must be strictly complied with.

The system must only be put to use for the first time by appropriately trained personnel. The system must not put to use until it has been established that it is ready for use and meets the requirements of the European Community's Machinery Directive.

Persons must only remain in the working range of the robot for as long as is necessary.

1.3.2 Sources of danger

The TSC 2013 is installed in the working range of the industrial robot. Robots have a very high diversity of movement and operate with high accelerations. In automatic operation the robot is program-controlled and may also start up unexpectedly after being at rest for a prolonged period. Persons struck by the motion of a robot may suffer severe and fatal injuries.

WARNING

Warning - the machine may start up unexpectedly!

1.3.3 Safety measures

The operator has to identify the dangers that may occur in connection with the welding system and estimate and minimise the associated risks.

Technical protective measures are to be selected and designed for the work to be performed which enable programming, setting up, maintenance, testing, fault-tracing and elimination of faults in safe conditions.

Personal protective equipment, e.g. safety shoes, protective clothing, protective goggles and gloves are to be worn.

1.3.4 Possible dangers due to fire

WARNING

There is a danger of fire in welding due to flying sparks!

Do no use any release agent for the spraying device other than that specified by the manufacturer!

Remove combustible material/packaging material from the system!

1.3.5 Possible dangers due to release agent

There is a safety data sheet for the release agent for spraying the gas nozzle in accordance with Regulation (EC) No 1907/2006 (REACH) (Section 5 Appendix).

NOTICE

The release agent AS 72-K does not contain any chemical substances subject to the duty of notification under Regulation No 1907/2006 (REACH).

1.4 Transport and storage

1.4.1 General

CAUTION

Danger of injury due to unsuitable means of transport and lifting implements.

The load must be adequately secured in transport!

NOTICE

Exercise great caution with the TC/TSC2013. Even minor damage can have a substantial adverse impact on function.

Do not throw, do not drop!

1.4.2 Transport and packaging

Before dispatch by ABB, each TSC 2013 or separately ordered assembly is checked for damage and completeness.

Protective packaging made of re-usable material is intended for transport.

The transport packaging is selected depending on the assembly to be supplied and number of units (Table 1-1).

The TSC 2013 is packed singly lying in a carton.

Several units are screwed standing on a wooden pallet and protected by a wooden crate against damage in transport.

The transport pallets are suitable for transporting with fork-lift truck.

Table 1-1 Transport weight and packaging

Pos.	Qty [units]	Components	Transport weight [kg]	Packaging
1	1	**TSC 2013 - complete**	35	**Carton**
	8	**TSC 2013 - complete**	approx. 350	**Pallet with wooden crate**
2	1	**TC 2013**	27	**Carton**
	10	**TC 2013**	approx. 365	**Pallet with wooden crate**
3	1	**Wire cutter**	1.5	**Carton**
	10	**Wire cutter**	approx. 17	**Carton**
4	1	**TCP gauging (Bulls Eye)**	1.5	**Carton**
	10	**TCP gauging (Bulls Eye)**	approx. 17	**Carton**
5	1	**TCP gauging with stand**	10	**Carton**
	10	**TCP gauging with stand**	approx. 180	**Pallet with wooden crate**

1.4.3 Damage in transport

If the TSC 2013 or separately ordered assemblies have been damaged in transport, the transport company must be informed immediately for an expert assessment and a concealed damage claim must be made.

1.4.4 Storage

The following should be observed in prolonged storage of the TSC 2013:

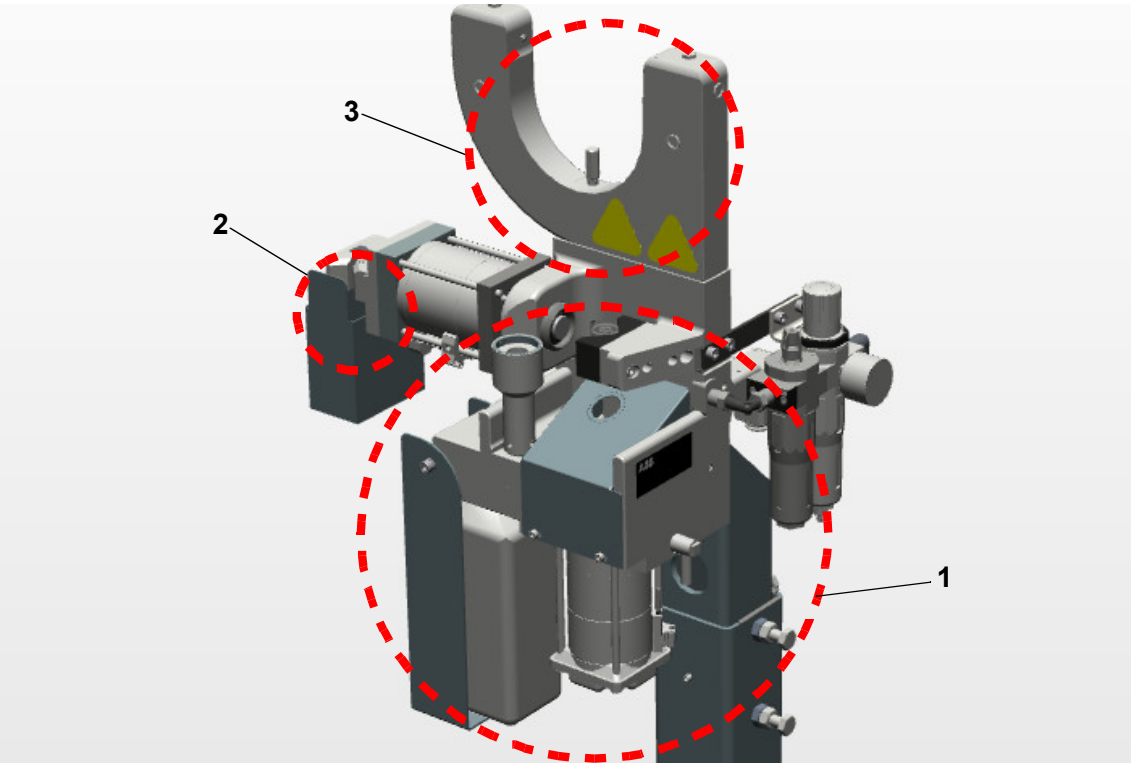
- storage as far as possible in the original packaging (carton or wooden pallet).
- Lubricate all bare steel parts lightly with commercial, silicone-free corrosion protection oil.
- Seal compressed air connections/plug connectors with protective caps.
- Protect stored parts against moisture.

1.4.5 Packaging/disposal

The transport packaging made available by ABB is used as packaging for the storage of system components. Disposal takes place only in accordance with contractual agreements entered into.

1.5 Structure and function

The TSC 2013 consists of three assemblies, which are also available separately.



1. Torch cleaner TC 2013
2. Wire cutter
3. TCP gauging

The TSC 2013 fulfils the following functions:

- cleaning the torch gas nozzle of weld spatter and spraying with release agent,
- shortening of the welding wire using a wire cutter,
- automatic measurement and adjustment of the robot tool center point - TCP.

Functional description

Torch cleaning is performed fully automatically by a rotating tool (milling cutter) in the TC 2013 torch cleaner **(1)**. The welding torch is clamped in a holding mechanism (V-block) for this purpose. The external surface of the contact tip nozzle and the internal surface of the gas nozzle are then cleared of weld spatter in one operation. The cleaned gas nozzle is then wetted with silicone-free liquid weld spatter release agent to prevent early deposition of new weld spatter.

The torch then automatically runs back to the wire cutter **(2)**. There the protruding welding wire end is introduced between fixed and mobile blades and then automatically cut.

Finally the tool center point is automatically measured in TCP measurement **(3)** and re-adjusted if necessary.

1.5.1 Torch cleaner TC 2013

The TC 2013 torch cleaner is used to clean the gas nozzle which is contaminated with weld spatter during the welding process. Subsequent spraying of the gas nozzle with a release agent prevents early contamination of the gas nozzle.

NOTICE

A detailed description can be found in Chapter 2 Torch cleaner TC 2013.

1.5.2 Wire cutter

The write cutter can be used to shorten the welding wire to a particular wire length. It is an add-on module for the TC 2013 torch cleaner and is also actuated from the latter.

NOTICE

A detailed description can be found in Chapter 3 Wire cutter.

1.5.3 TCP gauging (BullsEye®)

TCP measurement is used to measure and adjust the robot tool center point (TCP) It is available as an add-on module for the TC 2013 or a standalone version (with stand).

NOTICE

A detailed description can be found in Chapter 4 TCP gauging (BullsEye®).

1.6 Technical data of TSC 2013

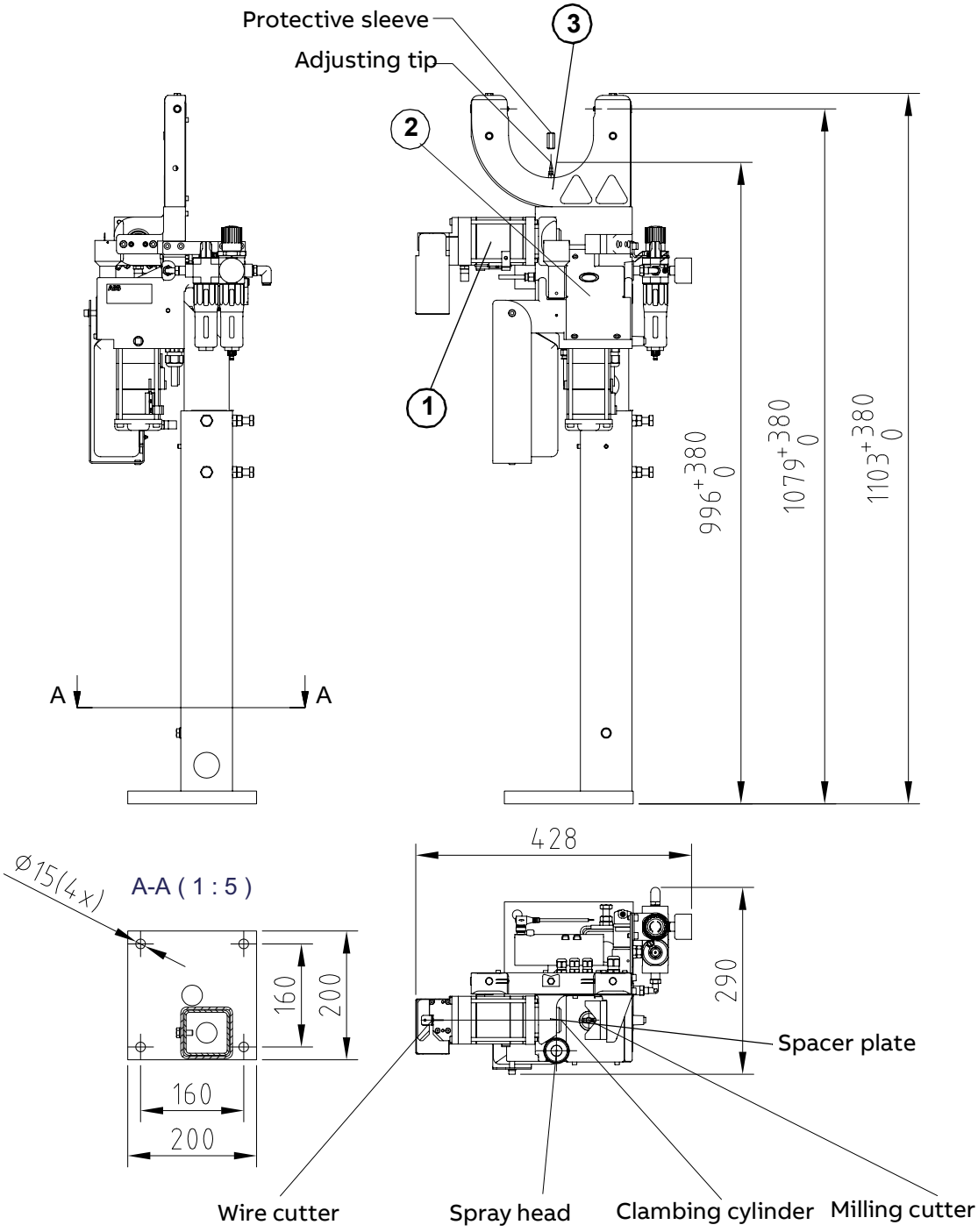
Control voltage	24VDC	
Max. current consumption	0,4 A	
Air connection	G 1/8"	at 6-10 bar
Clamping cylinder	Ø 65 x 34 mm stroke	F = 1227N at 5 bar
Gas nozzle external diameter	min. Ø 20 mm max. Ø 34 mm	adjustable using different spacer plate thicknesses
Milling cutter, V-block and spacer plate for standard torches PKH and PKI 500 (404.15.70) with torch external diameter Ø 28 mm.		
(Please enquire about milling cutter, V-block and spacer plate for special torches).		
Air motor	n = 950 / min Md = 3 Nm Stroke = 45 mm Shaft end Ø 9x16 length	
Air consumption	25 litres/cycle	
Max. welding wire diameter for cutting	d= 1.00 mm, steel d= 1.2 mm, aluminium d= 1.2 mm, steel	at min. air pressure 5 bar at min. air pressure 5 bar at min. **6 bar** air pressure
Dimensions	approx. 430 mm x 300 mm approx. 100 mm height	
Weight	34 kg	

Rating plate

There is a rating plate on the TC 2013 with the following particulars:

* Note: This number of sequential and is issued individually for each delivered TC 2013.

Dimensions of TSC 2013



Pos.	Assembly	Article No
1	Torch cleaner TC 2013	3HDA000057A5527
2	Wire cutter	3HDA000000A9289
3	TCP measurement	3HDA000000A9324
	Weight: 32 kg	without release agent

2 Torch cleaner TC 2013

TC 2013	means	T = Torch; C = Cleaner; 2013 = Generation 2013

The TC 2013 torch cleaner is an assembly which, unlike the TSC 2013, is supplied without a wire cutter and TCP gauging.

2.1 Use

2.1.1 Designated use

The TC 2013 torch cleaner is intended only for automatic cleaning of the contact tip and gas nozzle on the torch of a MIG/MAG robotic torch cleaning unit and for automatic spraying of a liquid weld spatter release agent.

Intended place of installation:

In the working area of an industrial robot.

Service life:

20 years

NOTICE

Designated use also includes observance of all notes in the installation instructions and compliance with the maintenance specifications.

2.1.2 Non-designated use

Any usage of the TV 3013 deviating from designated use is regarded as non-designated use.

The TC 2013 must only be used in accordance with the operating conditions and performance data stipulated in the installation instructions.

Other or more extensive use or unauthorised conversions or modification of the TC 2013 are deemed not to be in accordance with designated use.

Non-designated use invalidates the ABB warranty.

NOTICE

Product liability and and warranty are invalidated by unauthorised interventions and non-designated use.

The warranty covers elimination of faults and the use of parts which are shown to have become faulty or unusable due to material, design or production faults. Replaced parts become the property of the supplier.

2.2 Technical data of TC 2013

Control voltage	24VDC	
Max. current consumption	0,4 A	
Air connection	G 1/8"	at 5-10 bar
Clamping cylinder	Ø 65 x 34 mm stroke	F = 1227N at 5 bar
Gas nozzle external diameter	min. Ø 20 mm max. Ø 34 mm	adjustable using different spacer plate thicknesses
Milling cutters, V-blocks and spacer plates for standard torches PKH and PKI 500 (404.15.70) with torch external diameter Ø 28 mm.		
(Please enquire about milling cutters, V-plates and and spacer plates for special torches).		
Air motor	n = 950 / min Md = 3 Nm Stroke = 45 mm Shaft end Ø 9x16 length	
Air consumption	25 litres/cycle	
Max. welding wire diameter for cutting	d= 1.0 mm, steel d= 1.2 mm, aluminium d= 1.2 mm, steel	at min. air pressure 5 bar at min. air pressure 5 bar at min. **6 bar** air pressure
Dimensions	approx. 430 mm x 300 mm approx. 100 mm height	
Colour	RAL 7012 / Basalt grey	surfaces made of aluminium and high-grade steel are excepted
Weight	32 kg	

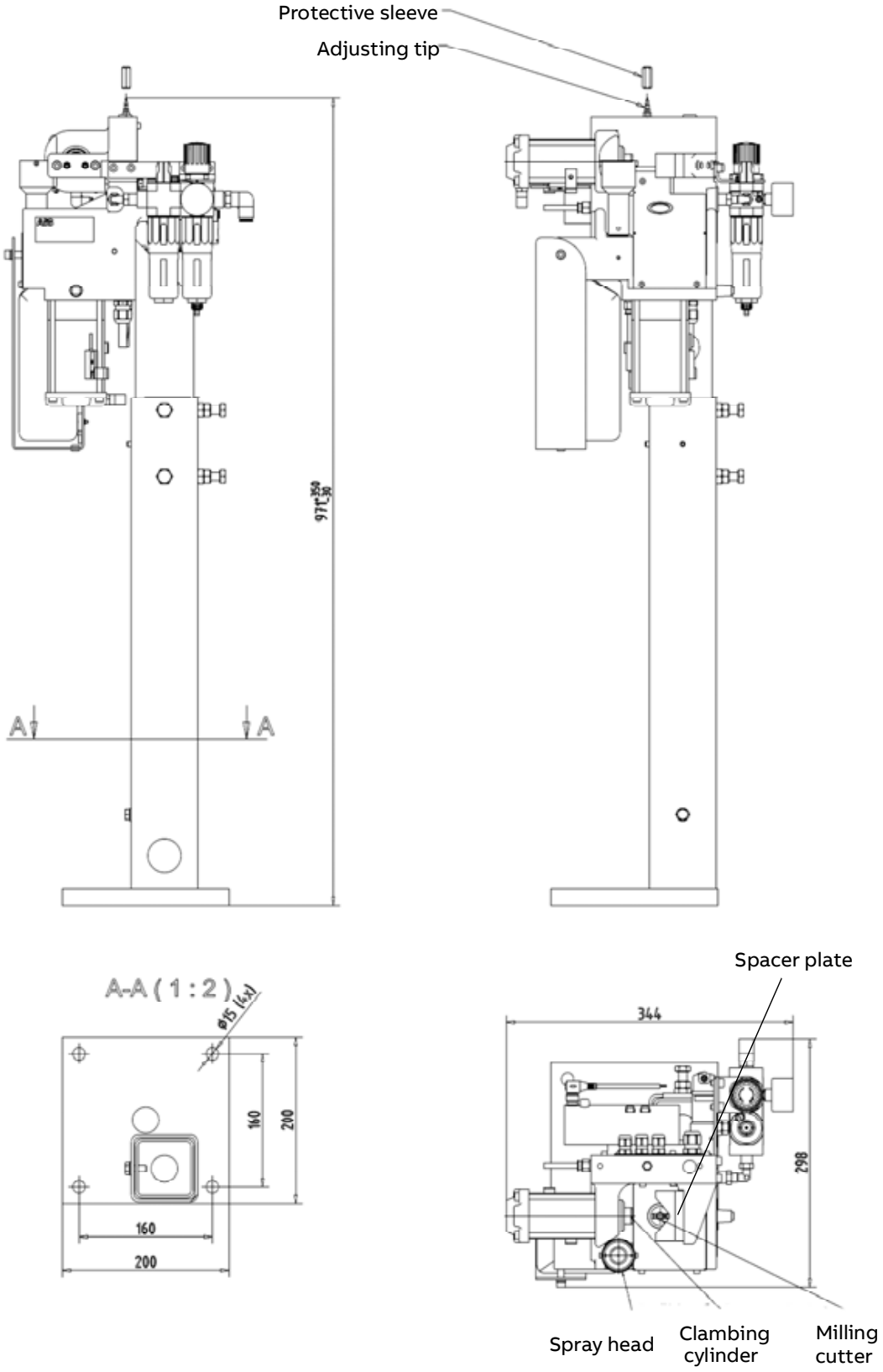
Rating plate

There is a rating plate on the TC 2013 with the following particulars:

* Note This number is sequential and is issued individually for each delivered TC 2013.

2.2.1 Torch cleaning device TC 2013

Figure 2-1 Dimensions TC 2013



2.2.2 Milling cutter

The milling cutter represented in Figure 2-1 for removing welding spatters is selected into dependence of the type of the gas nozzle.

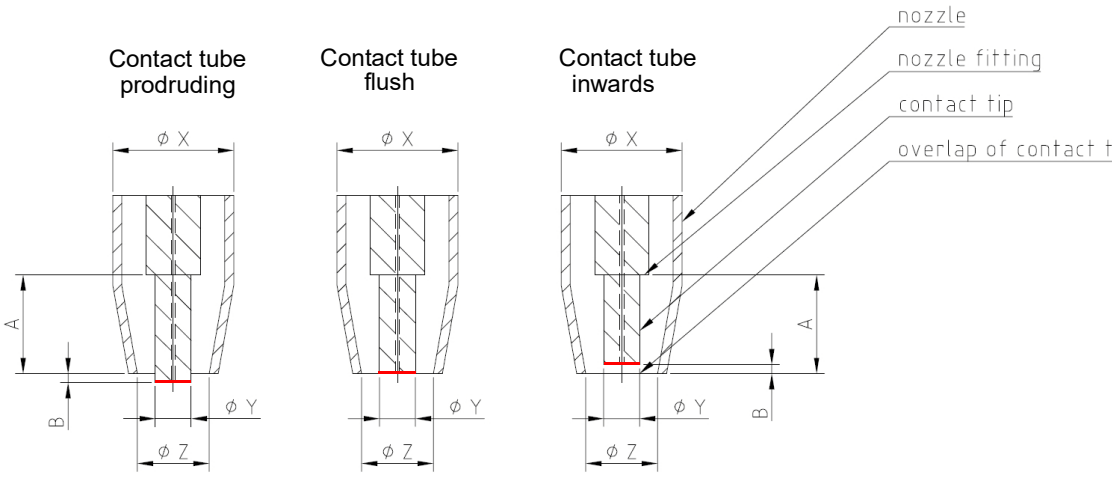
NOTICE

In principle, the TSC 2013 is delivered without milling cutter. This must separately be ordered from ABB as a spare part.

NOTICE

For the choice of a suitable milling cutter the measures as well as the construction of the gas nozzle are needed (see Figure 2-2).

Figure 2-2 Dimensions of the gas nozzle



Outside diameter gas nozzle	Ø X [mm]
Outside diameter contact tube	Ø Y [mm]
Inside diameter gas nozzle	Ø Z [mm]
Distance of leading edge to nozzle stick	A [mm]
Contact tube	prodruding
Contact tube	flush
Contact tube	inwards
Distance of leading edge to contact tube	B [mm]

NOTICE

The available values are to write down on the Dimension sheet Gas nozzle (see Chapter 5 Appendix) and have to be transmitted to ABB AG.

2.2.3 Spacer plates

The spacer plate represented in Figure 2-1 is selected into dependence of the used gas nozzle diameter.

NOTICE

The gas nozzle diameter has to be transmitted to ABB AG as in Section 2.2.2 "Milling cutter" described.

Spacer plates are available in the following strengths:

Table 2-1 Replacement spacer plates

Gas nozzle external diameter [mm]	Strength [mm]
Ø 16	12.50
Ø 17	11.85
Ø 18	11.20
Ø 19	10.55
Ø 20	9.90
Ø 21	9.25
Ø 22	8.60
Ø 23	7.95
Ø 24	7.30
Ø 25	6.65
Ø 26	6.00
Ø 27	5.35
Ø 28	4.70
Ø 29	4.05
Ø 30	3.40
Ø 31	2.75
Ø 32	2.10
Ø 33	1.45
Ø 34	0.80

NOTICE

Instructions for changing spacer plate and milling cutter you find in Section 2.3.3 "Replacement parts".

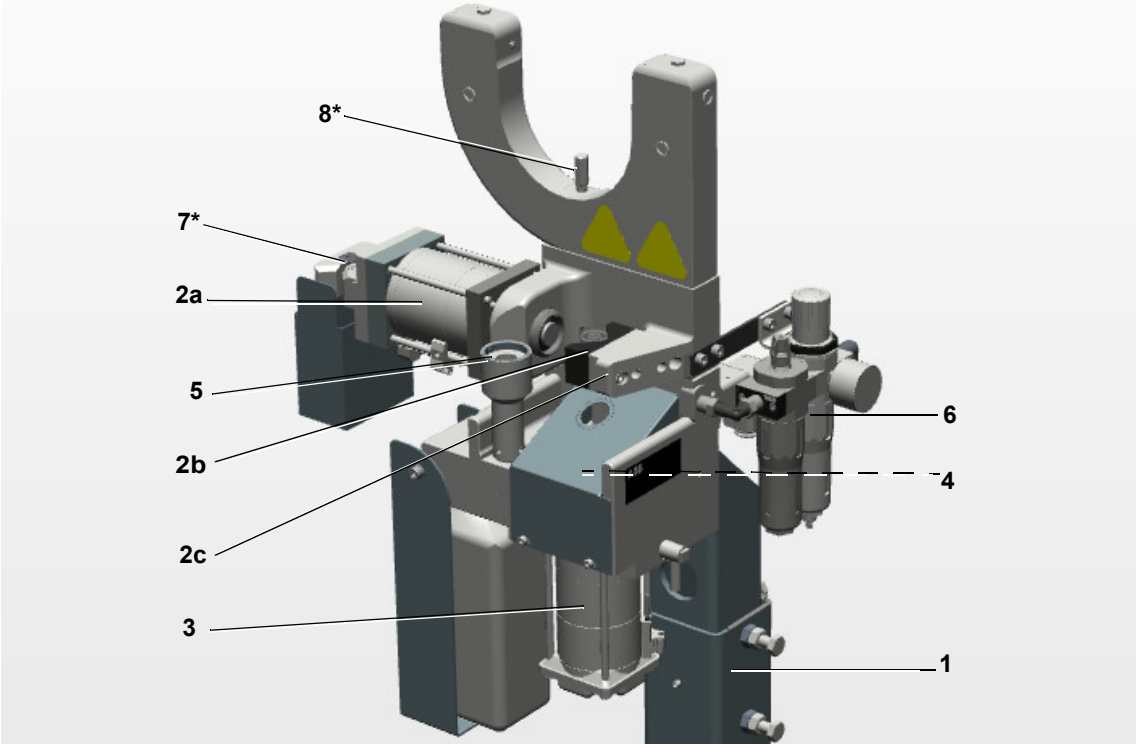
2.3 Structure and function

The function of the TC 2013, unlike the complete TSC 2013, contains only the cleaning/milling of the torch and subsequent spraying of liquid weld spatter release agent.

The wire-cutting and TCP gauging functions are included in the basic unit.

The wire-cutting add-on module and TCP gauging are available as optional extras and can be retrofitted at any time.

2.3.1 Structure



Pos.	Name	
1	Stand	
2a **2b** **2c**	Pneumatic clamping cylinder with V-block and spacer plate	
3	Motor pack consisting of air motor and feed unit	
4	Milling cutter	
5	Spray device	
6	Ventilation circuit with valves and maintenance unit	
7*	Wire cutter	**Option**
8*	TCP gauging	**Option**

2.3.2 Function

Torch cleaning is performed fully automatically by a rotating tool (milling cutter). The welding torch is clamped in a holding mechanism (V-block) for this purpose. The external surface of the contact tip nozzle and the internal surface of the gas nozzle are then cleared of weld spatter in one operation.

The cleaned gas nozzle is then wetted with silicone-free liquid weld spatter release agent to prevent early deposition of new weld spatter (see Chapter 5 Appendix).

The spraying cycle and spraying time (quantity) are set in the robot program. The feed rate for the cleaning tool is set on the choke in the cast block.

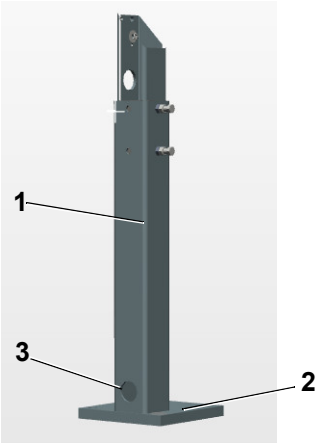
2.3.2.1 Stand (Pos. 1)

The TC 2013 is fitted as standard with an adjustable stand for floor assembly.

This consists of a height-adjustable rectangular tube **(1)** with a foot attachment **(2)** for floor assembly.

The TC 2013 is set to minimum height on delivery.

The operator must set and then peg the optimum height on the spot.



WARNING

Danger of crushing when adjusting stand height.

The stand of the TSC is made of hollow sections allowing height adjustment. The connecting line can be passed through the hollow section. There is an opening **(3)** to pass the line out of the stand at the bottom.

This opening **(3)** must not gripped when adjusting the stand height as this can lead to serious injury.

Height adjustment without TCP gauging

It is recommended that the optimum height is determined depending on the center of the fulcrum of robot axis 2 (guide value).

Optimum height means that the robot arm reaches the TC2013 by the shortest route and can swivel in horizontally with minimal height movement.

Height adjustment with TCP gauging

The height should, as a rule, be set approx. 200 mm lower than in the case of the TC 2013 without TCP gauging.

2.3.2.2 Clamping cylinder with V-block (Pos. 2a....2c)

The welding torch is pressed against the clamping V-block **(2b)** by pneumatic clamping cylinder **(2a)** and is thus firmly clamped in during milling. As the welding torch is clamped centrally with respect to the milling cutter, the V-block must be set to the appropriate torch diameter with a suitable spacer plate **(2c)** (for selection of spacer plates see Table 2-1).

2.3.2.3 Motor pack (Pos. 3)

The air motor is integrated into the pneumatic feed cylinder and thus forms a common motor pack. The shaft end of the air motor carries the milling cutter.

2.3.2.4 Milling cutter (Pos. 4)

There are suitable milling cutters for the welding cutter nozzles concerned for internal and external cleaning.

2.3.2.5 Spray device (Pos. 5)

The spray device consists of a 3/2-way valve, the spray head and a release agent tank with liquid sensor. The spray device wets the cleaned gas nozzle with release agent free of silicone and solvent. This prevents the early deposition of weld spatter.

2.3.2.6 Ventilation circuit with valves and maintenance unit (Pos. 6)

For explanations on the ventilation circuit, see Section 2.9 "Pneumatic plan".

2.3.2.7 Wire cutter (Pos. 7*) - Option

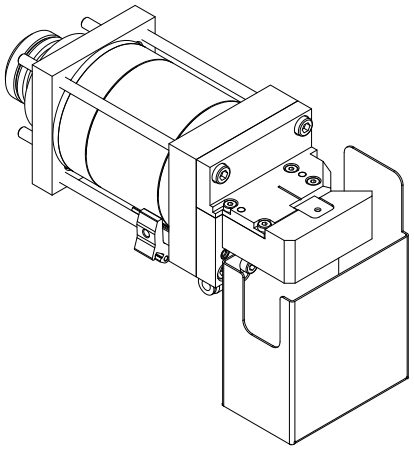
The wire cutter is an add-on module for the TC 2013 and can be retrofitted at any time.

The cutting plate is mechanically connected to the clamping cylinder of the TC 2013 and does not require any additional control elements.

With the wire cutter the

- welding wire is cut to the desired length,
- bent or excessively projecting wire is cut off,
- the end of the wire is cut off before each torch cleaning and where appropriate before each TCP gauging,
- and slag formed at the end of the wire is cut off.

As a result arc ignition behaviour is improved and availability is increased.



Subsequent addition to TC 2013

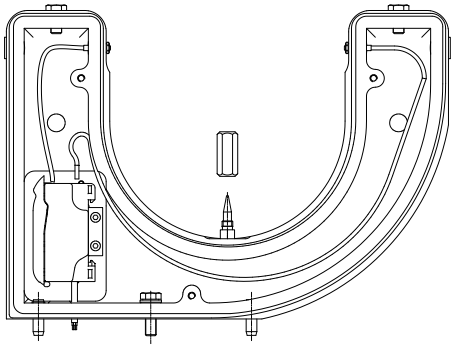
Instructions for retrofitting of the wire cutter can be found in Chapter 3.6 Assembly of the wire cutter on the TC 2013.

2.3.2.8 TCP gauging (Pos. 8*) - Option

TCP gauging is an add-on module for the TC 2013 and can be retrofitted at any time.

TCP gauging is used solely to gauge and adjust the robot tool center point (TCP).

Deviations of the torch TCP are gauged. If the tolerance is exceeded, the torch system of coordinates is automatically corrected.



Subsequent addition to TC 2013

Instructions for retrofitting of TCP gauging can be found in Chapter 4.7 Assembly.

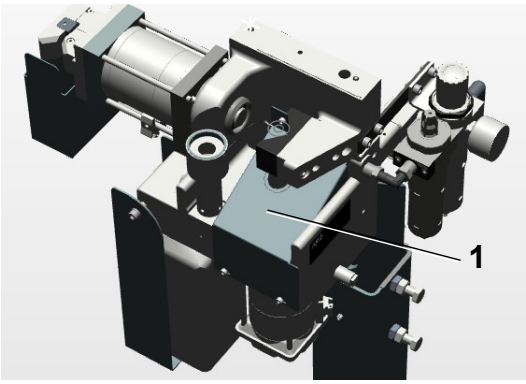
2.3.3 Replacement parts

The replacement parts include:

- Milling cutter (can be ordered individually)
- Replacement spacer plate for the clamping V-block (can be ordered individually)
- Release agent tank (1 litre silicone-free weld spatter release agent)

2.3.3.1 Replacing milling cutter

1. Remove protective cover **(1)**.
2. On the milling cutter detach threaded pin M 5x6 and pull off milling cutter.
3. Put on new milling cutter and tighten with threaded pin M 5x6.
4. Re-attach the protective cover **(1)** after replacing the milling cutter.

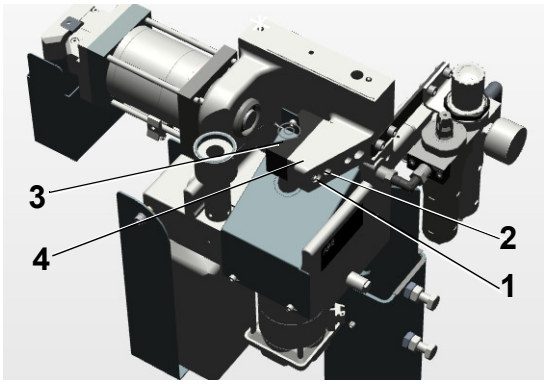


NOTICE

At the factory the motor shaft is drilled approx. 1 mm deep through the core hole in assembly of the first milling cutter in order to safely rule out axial migration of the milling cutter.

2.3.3.2 Replacing spacer plate

1. The clamping V-block is screwed on with 2 cheese-head screws and pegged. Detach screws **(1)** and pins **(2)**.
2. Take off clamping V-block **(3)** and spacer plate **(4)**.
3. Select new spacer plate (see Table 2-1) and screw back on clamping V-block and peg.



NOTICE

The center misalignment of the torch nozzle must then be corrected in the robot program.

2.4 Assembly and disassembly

2.4.1 General

The TC 2013 is supplied fully assembled.

Each individual unit is tested after manufacturing and provided with a serial number. The test results are recorded.

After receipt of the delivery, the TC 2013 is to be examined for any damage in transport and for completeness on the basis of the delivery note.

WARNING

Before work is undertaken on the TC 2013 the power supply to the system is to be disconnected and protection against switching back on is to be ensured.

All hoses must be pressureless and empty.

2.4.2 Setting up and securing

1. The TC 2013 is to be set up vertically at a suitable place in the robot welding system.

Suitable means:

- within the working range of the robot,
- outside the interference edges of a tool clamping mechanism,
- outside the interference edges of a rotary positioner / turntable
- The basic position of the robot is preferably defined with the arrangement of the TC 2013.

CAUTION

There is a danger of the TC 2013 tipping over, and it should therefore be secured immediately after being set up.

A steel plate or a concrete floor with a quality of at least B 25 is necessary as a base. The base must be a continuous unit. Setting up over an expansion joint is not permitted.

2. Screwing and pinning of the baseplate of the TC 2013 with the base (4 x M 12 screws).
3. Determination and setting of optimum height and subsequent pegging.

4. Connect grounding cable (threaded drilled hole M8 in the lower area of the stand).
5. Connect compressed air.
6. Connect power supply .
7. Unscrew release agent tank and connect filled position sensor.

2.4.3 Installation

2.4.3.1 Electrical installation

WARNING

Electrical installation must only be performed by qualified personnel!

NOTICE

The attached electrical circuit diagram must be observed in installation! (see Chapter 2.10 Electrical circuit diagram).

The grounding actions performed must be checked by measurements and recorded.

It must be ensured in installation of the TC 2013

- that the cables do not rest on sharp edges,
- that the cables as far as possible are laid in a cable duct,
- the of risk of tripping is minimised.

Before electrical installation work is performed on the TC 2013

- disconnect the power supply to the control part,
- turn off the main on/off switch,
- safely turn off the air supply to the TC 2013,
- keep the system pressureless.

2.4.3.2 Pneumatic installation

CAUTION

Installation of the pneumatics must only be performed by qualified personnel!

The TC 2013 is to connected so that the valves are not electrically live in an emergency stop.

NOTICE

The attached pneumatic diagram must be observed in installation! (see Chapter 2.9 Pneumatic plan).

The connection of compressed air takes place at the push-in fitting or the screw-in thread G 1/8" at the filter regulator.

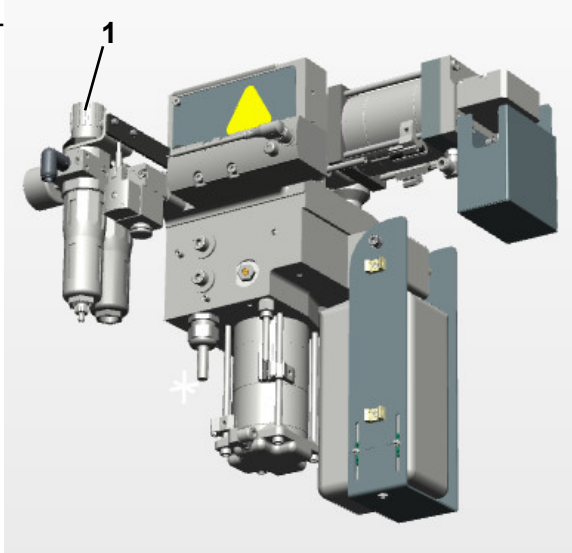
Air quality

The compressed air must comply with „class 4“ or better in accordance with to ISO 8573-1:2010.

Operating pressure

The operating pressure for the TC 2013 must be at least 5 bar and must not exceed 10 bar. It acts in the same way for all air consumers on the unit.

- The operating pressure is set on the maintenance unit **(1)** for the complete unit and should no longer be changed.
- The quantity of oil through-flow at the oiler should be one drop per 6-10 cleaning cycles and the air motor and the pneumatic cylinders should be adequately lubricated.

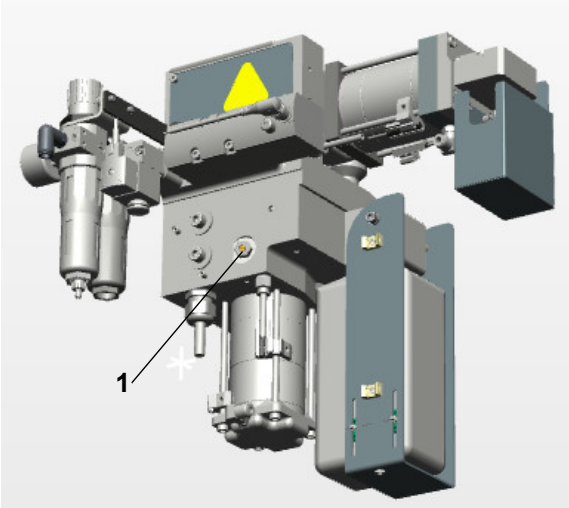


2.4.4 Setting

2.4.4.1 Setting of milling cutter

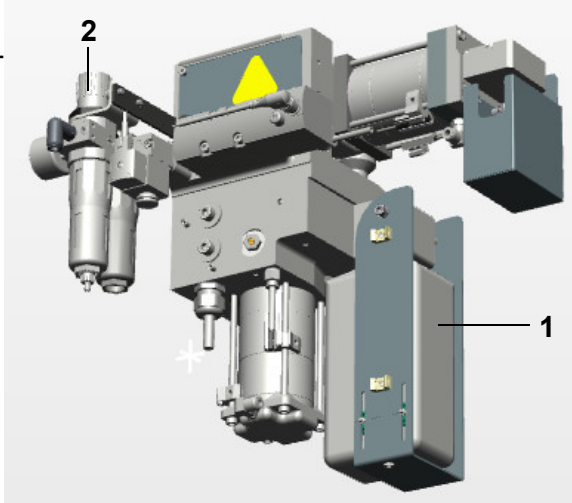
Cleaning time and milling cutter feed are directly related. If the milling cutter feed is at its maximum, the cleaning time should be programmed one second longer. Complete cleaning is achieved in a shorter time.

- Milling cutter fed and milling cutter speed are set on the air exhaust throttle valve **(1)** .
- The cleaning time is controlled through the cleaning program in the robot control.
- The feed rate is approx. 20 mm/sec, i.e. approx. 2-2.5 sec is to be set for 45 mm stroke.
- The completed stroke is reported by the sensor.



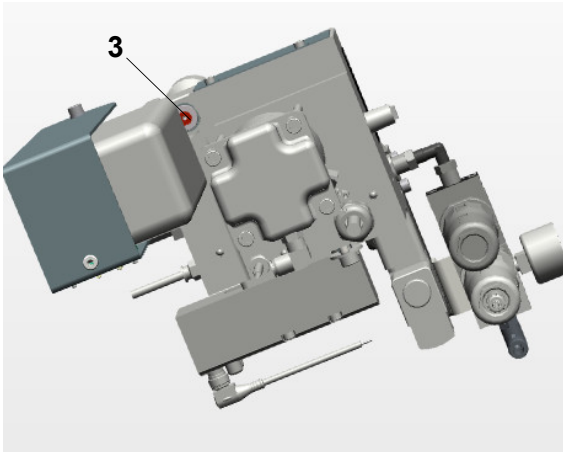
2.4.5 Setting of spray mechanism

1. Check level of liquid in release agent tank **(1)** and if necessary top up or replace bottle.
2. Set system pressure of 6 bar in the pressure control valve **(2).**



3. The degree of nebulisation is set on the setting screw **(3)**.
4. Slowly open setting screw until optimum nebulisation is reached.
5. The amount of spray is regulated by the software using the spraying time.

Note: Quantity sprayed and spraying time should be kept as small as possible to avoid an excess of release agent (drips onto weld seam impairs seam quality).



2.4.6 Disassembly

CAUTION

Before the TC 2013 is disassembled the unit must be completely switched off and protected against being turned back on!

All lines must be pressureless and empty.

1. Disconnect power supply.
2. Disconnect compressed air connection.
3. Detach grounding cable.
4. Detach filled position sensor and unscrew release agent tank.
5. Remove screws and pins from the baseplate of the stand.
6. Take off TC 203 and carefully place on a suitable surface.

2.4.7 Disposal

Current directives and laws on waste must be observed.

- Framework Waste Directive 2008/98/EC.
- Waste Shipments Regulation 2006/1013/EC.
- German Recycling and Waste Disposal Act (KrWG)

Waste within the meaning of the Recycling and Waste Disposal Act (KrWG) is all materials or objects which their owner disposes of, wishes to dispose of or has to dispose of. Waste for recycling is waste which is recycled; waste which is not recycled is waste for disposal.

The disposal of waste should preferably take place within the country. Waste avoidance takes precedence over waste recycling.

NOTICE

The operator is obliged to comply with applicable federal, state and municipal regulations for disposal and scrapping.

Environmentally hazardous materials are to be disposed of in accordance with local regulations and ordinances.

2.5 Commissioning

2.5.1 Instructions for commissioning

Before operating for the first time it should be checked that

- all components are correctly assembled and attached,
- all electrical connections are correctly made,
- all pneumatic connections are correctly dimensioned and connected,
- all supply lines have been installed,
- the functioning of all safety devices has been ensured,
- there is sufficient oil in the oiler,
- there is sufficient release agent in the release agent tank,

WARNING

Danger from incorrect connections/settings and non-functioning/missing safety devices.

2.5.2 Function test

A function test in manual mode is to be performed during commissioning of the TC 2013.

WARNING

Tests may only be performed in manual mode and only by qualified personnel.

Ensure in testing or programming work that the welding torch is correctly introduced into the TC 2013 by the robot.

Ensure in testing the TC 2013 in connection with a welding torch that no weld spatter, metal chips or debris from a broken milling cutter of spray fluid enter the eyes.

CAUTION

Wear suitable protective goggles!

Do not place fingers in the rotating milling cutter or in the clamping device (V-block)!

Danger due to unexpected starting of the milling cutter!

2.5.3 Switching on

The TC 2013 is ready for operation when the robot control is switched on.

⚠ CAUTION

Danger of electric shock!

Make sure that all live components are properly covered.

2.5.4 Modes

The welding system is designed for automatic operation.

The program specified for the TC 2013 is designed for automatic operation.

It is possible to choose between manual and automatic on the mode selector switch of the system.

2.5.5 Sequence of operation

The robot is in the basic setting. The welding torch is generally inside the torch cleaner, above the spray head.

2.5.5.1 Cleaning

After a cleaning program contained in the robot is called up

- the welding torch is run into the cleaning position of the torch cleaner,
- the clamping cylinder fixes the torch in the V-block as soon as the welding torch has reached the cleaning position,
- the tool air motor starts to turn,
- the tool unit with the milling cutter runs vertically from above into the torch and cleans the gas nozzle and contact tip nozzle.
- If there is a blow-out valve, the chips remaining in the torch can be blown out.

Machining time and tool feed are directly related. If the milling cutter feed is at its maximum, the machining time should be programmed one second longer. Complete cleaning is not achieved if the machining time is shorter.

The sensor reports the start of cleaning.

If the cleaning time defined in the cleaning program has ended, the tool unit, then the tool motor and afterwards the clamping cylinder are returned to the starting position.

Recommendation:
Simultaneous blowing out and cleaning!

2.5.5.2 Spraying

If the clamping cylinder is in the basic setting, the program receives a signal message from a switch. This feedback starts the next spraying program.

- The robot runs the cleaned welding torch into the spray position.
- The spraying device wets the torch head with an anti-adhesion fluid which prevents early deposition of new weld spatter.
- The period of spraying is fixed in the program. Two short sprays is better than one long spray. The spraying process is over when the time runs out.
- If there is no wire-cutting program, the robot runs into the basic setting and reports end of program and readiness to start for continued running through the welding program.
- The screen of the spray nozzle can be removed for cleaning purposes.

2.5.5.3 Wire cutting (option)

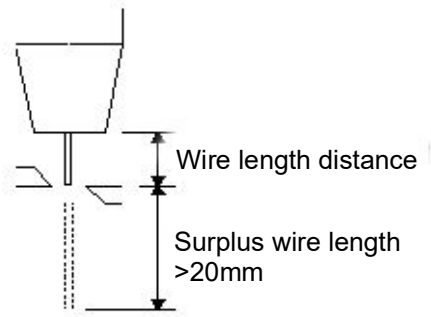
The robot is in the basic setting. The welding torch is generally inside the torch cleaner, above the spray head.

After a wire-cutting program contained in the rotor is called

- the cutting knife is opened
- the clamping cylinder also closes automatically, as the two motions are linked.

- The welding torch runs to the desired wire length distance (e.g. 10 mm) above the knife into the wire-cutting position of the torch cleaner.
- The wire feed advances a welding wire surplus length of **at least 20 mm**!

  (A surplus wire length of at least 20 mm is necessary to avoid disturbance of operation due to wire waste.)



- The knife closes and cuts the welding wire to the desired wire length distance. The knife and clamping cylinder are then back in their basic position.
- The robot runs into the basic setting and reports end of program and readiness to start for continued running through the welding program.

A detailed description of the wire cutter can be found in Chapter 3 Wire cutter.

2.5.5.4 TCP gauging (option)

Gauging of the TCP (Tool Center Point) is optionally included in the robot program and is performed automatically. It is recommended that the TCP is also re-gauged after each torch cleaning operation.

A detailed description of TCP gauging can be found in Chapter 4 TCP gauging (BullsEye®).

2.6 Program sequence for torch cleaning

Configuration, programming and sequence of the torch cleaning station are described below.

The rapid instructions, which allow for simple use of the torch cleaning station, are made available with the option "653-3 ABB TSC2013".

NOTICE

The detailed description of this option can be found in the operating instructions "3HCA024847-001 Torch Services", which are supplied with the RobotWare documentation.

If this software option is not present in your robot system, the movements and signal sequences as well as optional error management must be programmed manually

2.6.1 General

The TC 2013 torch cleaning system has an EA interface, which can depict the following signal conditions:

- digital input clamping element open
- digital input clamping element closed
- digital input milling cutter in upper end position
- digital input milling cutter in lower end position
- digital input release agent present
- digital output, start of torch cleaning (milling cutter in) or wire cutting (dual function)
- digital output torch blow-off (depending on welding equipment used)
- digital output spraying

The software option "653-3 ABB TSC2013" makes separate rapid instructions available for torch cleaning, torch blow-out/spraying and shortening of the welding wire. The operator or programmer does not have to take account of the activation of inputs and outputs. This is taken over by rapid instructions. The necessary signals merely need to be defined and correctly reported in the configuration.

The following instructions are available.

- ***MoveMechCleanL / MoveMechCleanJ*** for torch cleaning
- ***MoveSprayL / MoveSprayJ*** for spraying of the release agent
- ***MoveWireCutL / MoveWireCutJ*** for shortening of the welding wire

2.6.2 Program examples

Program example Torch cleaning/Torch spraying:

```
!-----------------------------------------------------------------
! Procedure MechCleanGun
!-----------------------------------------------------------------
!
PROC MechCleanGun()
  !
  !Vorposition (sichere Position zum erreichen des TC96)
  MoveAbsJ jtApproachTSC,v500,z50,tWeldgun;
  !
  ! 1. Anfahren der Zustellposition          => pApproachClean
  ! 2. Exaktes anfahren der Reinigunsposition => pMechClean
  ! 3. Instruktion steuert den Ablauf  der Reinigung
  MoveMechCleanL pApproachClean,pMechClean,v200,z1,tWeldgun;

  !Brenner mit Trennmittel besprühen
  MoveSprayL pApproachSpray,pSpray,v200,fine,tWeldgun;
  !
  !Vorposition erneut anfahren
  CellMoveAbsJ jtApproachTSC,v500,z50,tWeldgun;
  !
ENDPROC
```

Program example Welding wire shortening:

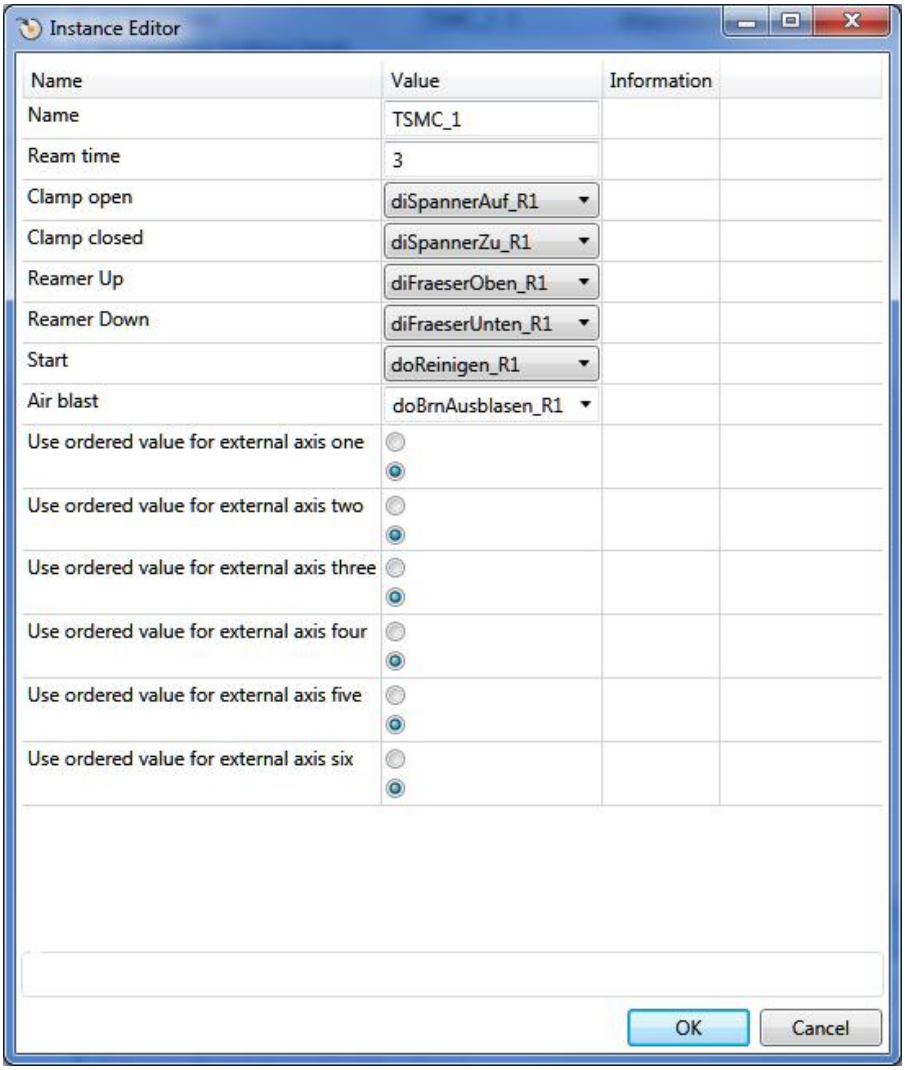
```
!-----------------------------------------------------------------
! Procedure WireCut
!-----------------------------------------------------------------
!
PROC WireCut()
  !
  !Vorposition (sichere Position zum erreichen des TC96)
  MoveAbsJ jtApproachTSC,v500,z50,tWeldgun;
  !
  ! 1. Anfahren der Zustellposition          => pApproachCutter
  ! 2. Exaktes anfahren der Cuttposition     => pCuttPos
  ! 3. Instruktion steuert den Ablauf des Abschneidens
  MoveWireCutL pApproachCutter,pCuttPos,v200,z1,tWeldgun;

  !Vorposition erneut anfahren
  CellMoveAbsJ jtApproachTSC,v500,z50,tWeldgun;
  !
ENDPROC
```

2.6.3 Configuration for TC 2013

2.6.3.1 Configuration for torch cleaning

The configuration for torch cleaning can take place via RobotStudio or directly via the FlexPendant of robot control. The configuration is produced in the process configuration database (Proc.cfg).

RobotStudio - view of the configuration for torch cleaning (Torch services mech clean properties)

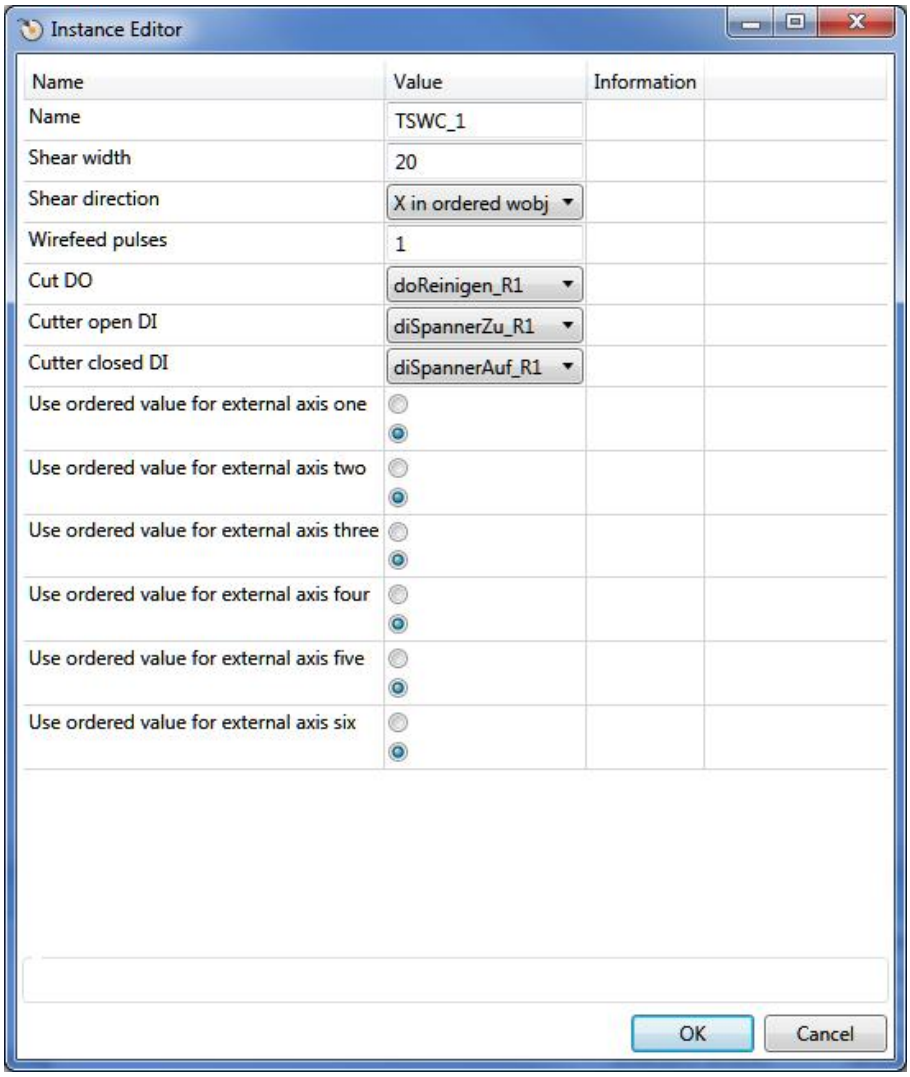


Parameter view in a text editor:

```
TS_MECHCLEAN_PROP:

      -name "TSMC_1" -ClampOpen "diSpannerAuf_R1" -ClampClosed "diSpannerZu_R1"\
      -ReamerUp "diFraeserOben_R1" -ReamerDown "diFraeserUnten_R1"\
      -Start "doReinigen_R1" -AirBlast "doBrnAusblasen_R1"
```

2.6.3.2 Configuration for wire cutting

RobotStudio - view of the configuration for wire cutting (Torch services wirecut properties)

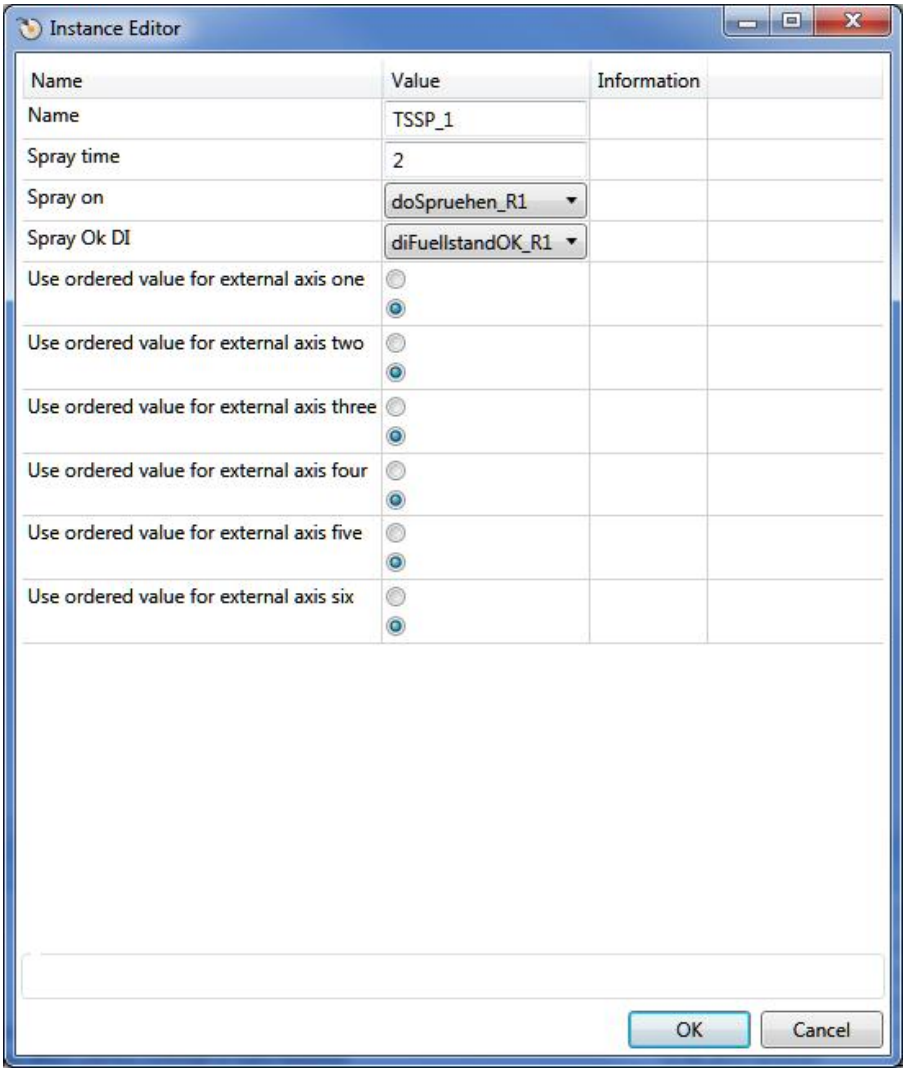


Parameter view in a text editor:

```
#
TS_WIRECUT_PROP:

      -name "TSWC_1" -Cut "doReinigen_R1" -CutterOpen "diSpannerZu_R1"\
      -CutterClosed "diSpannerAuf_R1"
```

2.6.3.3 Configuration torch spraying

RobotStudio - view of the configuration for torch spraying (Torch services spray properties)



Parameter view in a text editor:

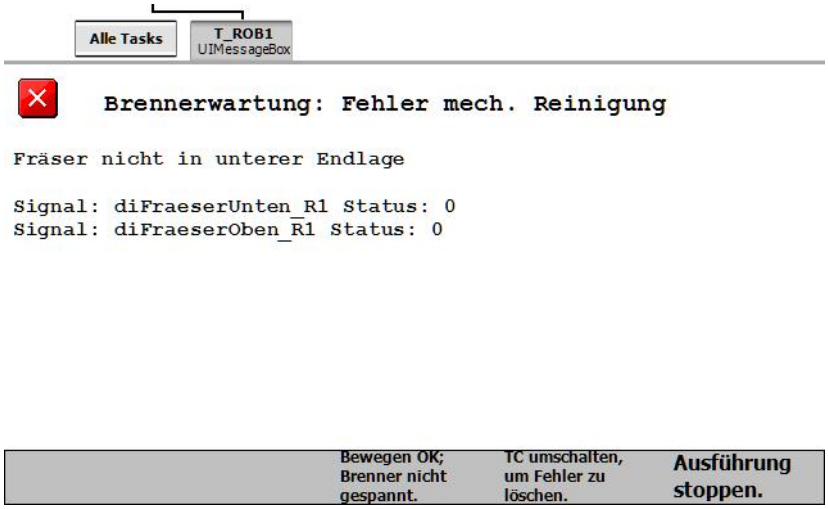
```
#
TS_SPRAY_PROP:
        -name "TSSP_1" -SprayOn "doSpruehen_R1" -SprayOK "diFuellstandOK_R1"
```

2.6.4 Sequence of torch cleaning

The instruction "MoveMechCleanL" moves the robot via a preliminary position directly to the cleaning position and checks whether the milling cutter in the lower end position and the clamping element is open. In the case of incorrect signal states an operator dialogue is automatically opened on the FlexPendant and operator interaction is necessary. In the case of correct signal states the cleaning sequence is started. The set time for torch cleaning does not start until the milling cutter has reached the upper end position. After the end of the cleaning time the clamping element is opened and the robot returns to the preliminary position.

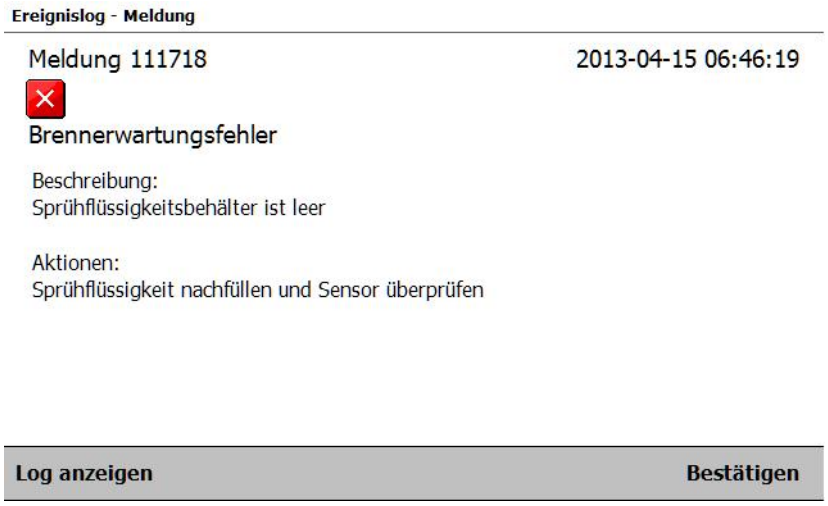
Note: The milling cutter must be set so that it has reached the upper end position in 30 seconds, as an error message otherwise appears.

Operator interaction in faulty signal states of the milling cutter



If here is no release agent in the tank or the level of release agent is too low, an error message occurs, however the robot program is not interrupted.

Result log - message



2.6.4.1 Sequence of torch cleaning without software option "653-3 ABB TSC2013"

Example of a possible sequence for torch cleaning without software option "653-3 ABB TSC2013":

1. Robot runs into a safe position close to the cleaning position.
2. Checking of the signal statuses "clamping elements open" and "milling cutter in lower end position"
3. Robot runs into cleaning station.
4. Setting of the output "start of cleaning".
5. Checking of the signal statuses "clamping elements closed" and "milling cutter in lower end position".
6. Milling (waiting time).
7. Resetting of the output "start of cleaning".
8. Checking of the signal status "clamping elements open" and "milling cutter in lower end position"
9. Robot runs out of the cleaning station into a safe position.

2.6.4.2 Sequence of wire cutting without software option "653-3 ABB TSC2013"

Example of a possible sequence for shortening of welding wire without software option "653-3 ABB TSC2013":

The output for cleaning of the welding torch (milling cutter) is used at the same time for shorting of the welding wire. The same applies to the "clamping element opened/closed" signals.

1. Robot runs into a safe position close to the wire cutter.
2. Setting of the output "start of cleaning".
3. Checking of the signal state "clamping element closed" (wire cutter open).
4. Robot runs into the position for shortening of the welding wire.
5. Resetting of the output "start of cleaning" (cutting of wire end).
6. Checking of the signal state "clamping element closed" (wire cutter open).
7. Robot runs into a safe position.

2.6.4.3 Sequence of spraying without software option "653-3 ABB TSC2013"

Example of a possible sequence for spraying of the release agent without software option "653-3 ABB TSC2013":

1. Robot runs into a safe position close to the spraying position.
2. Robot runs into the precise spraying position.
3. Setting of the output "release agent spraying".
4. Waiting time for release agent spraying.
5. Resetting of the output "release agent spraying".
6. Robot runs into a safe position.

In all the sequences listed above only the sequence with correct signal states is explained. An error strategy is to be planned for the event of faults.

NOTICE

The existing program serves only as a model!

The customer-specific program is dependent on the type of system.

2.6.4.4 Trial run

The following should be fulfilled in the trial run:

1. Ensure that there is no compressed air on the TC 2013. Uncontrolled movements are consequently avoided.
2. Then run through the sub-program for torch cleaning step by step.
3. After the trial run switch the compressed air back on run through the program in automatic mode.
4. Check the welding torch position inside the torch cleaner (milling cutter fracture possible).

- Contact tip nozzle, gas nozzle and milling cutter must move in clamped condition.
- Contact tip, gas nozzle and milling cutter must not stick.

CAUTION

Wear suitable protective goggles! The miller cutter may break. Spray fluid may enter the eyes.

Do not hold fingers in the rotating milling cutter or in the clamping device (V-block)!

Danger from unexpected starting of the milling cutter!

2.7 Maintenance

WARNING

Before servicing and maintenance work the TC 2013 is to be made pressure-less and disconnected from the power supply and protected against being switched back on.

The TC 2013 torch cleaning station is largely maintenance-free due to the use of high-quality components. The frequency of individual checks and maintenance work is guided by the particular conditions of use of the TC 2013.

We recommend the following maintenance plan to guarantee perfect functioning of the TC 2013.

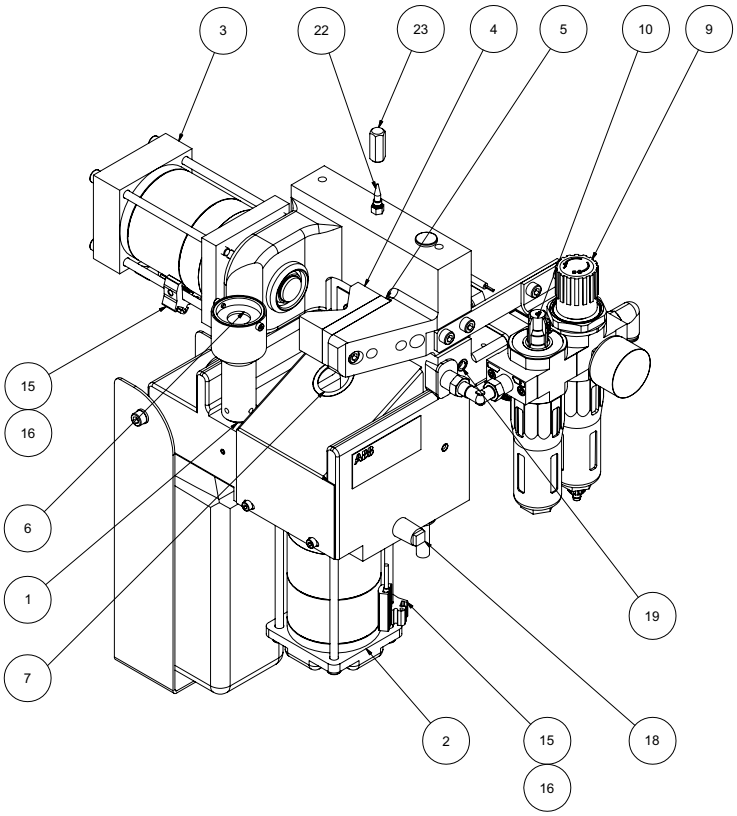
Interval	Machine part	Activity	Remark
daily	TSC 2013	Visual inspection	
weekly	Spray nozzle	- Test, - Clean when required	
	Milling cutter unit	- Test, - Clean when required	Do not use compressed air
	Maintenance unit pressure regulator	Check pressure	Values see Chapter 2.2 Technical data of TC 2013
	Maintenance unit oiler	Check fill-up quantity	Mineral oil to DIN 51524-HLP 32
	Release agent container	- Check fill-up quantity - Visual inspection on damage - Exchange when required	ABB ordering No 0.743.505.003 **
	Cutting knife	- Clean with brush and grease lightly - Check on wear	Grease
	Milling cutter	Check on wear, damage and firm seating	
	Wire collecting container	Regularly empty	
monthly	Emergency stopping devices	Test emergency stopping devices for function.	
	Maintenance unit air filter	Check on pollution	
	Cable and connector	Check for damage and buckling.	
	V-block TC 2013	Check on wear	
2 annual	Release agent container	Exchange of the container	ABB ordering No 0.743.505.003 **

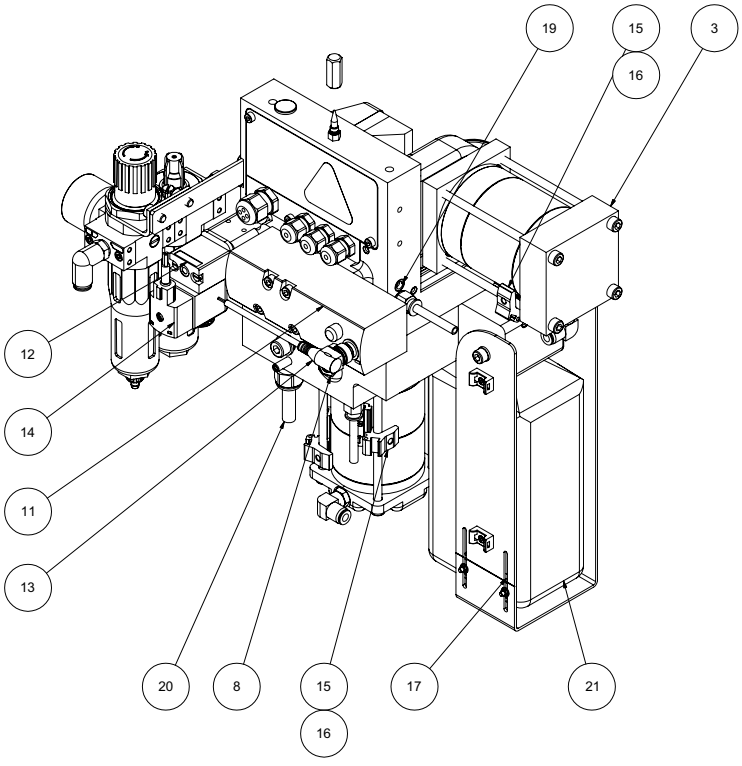
*) Mineral oil in accordance with DIN 51524-HLP 32, viscosity 32 cST at 40°C

**) Use only AS 72-K genuine spatter release agent!

2.8 Spare and wearing parts for TC 2013

2.8.1 TC 2013 without wire cutter

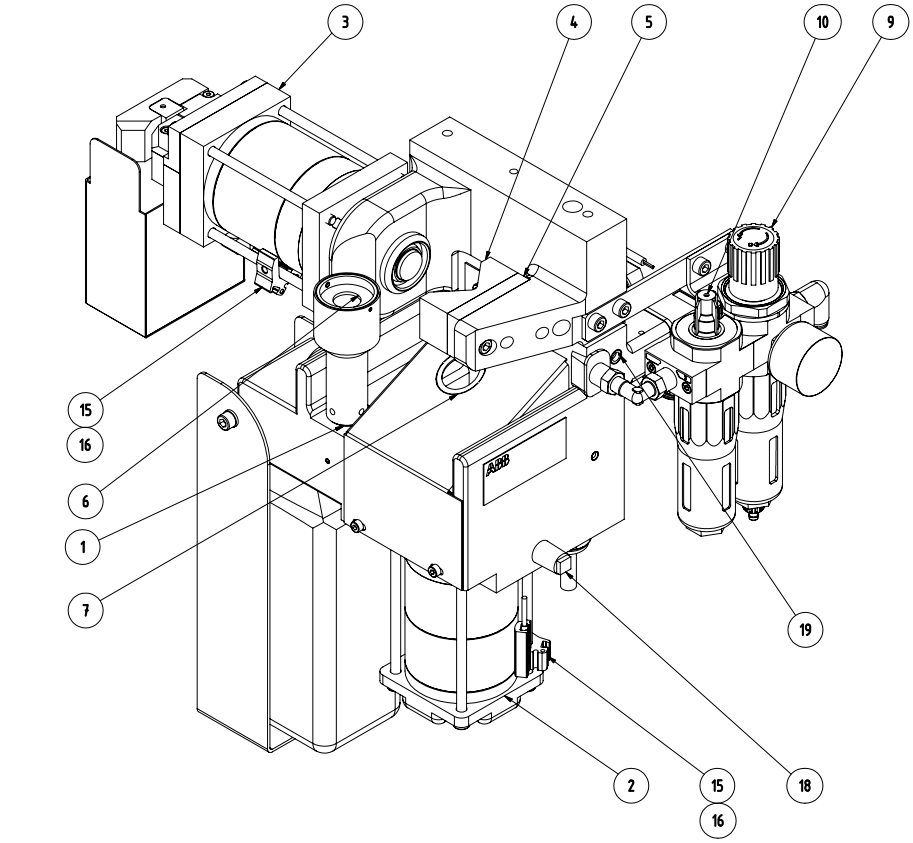


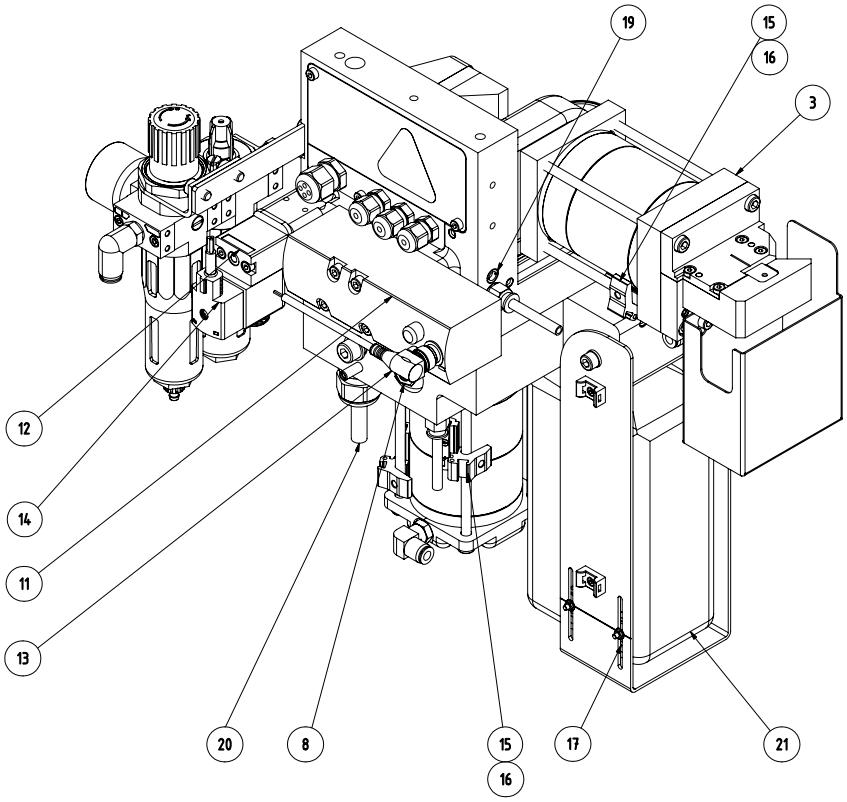


Pos.	Qty	Name	ABB Article No	Spare part	Wearing part
1	1	**Spray head TC 2013**	**3HDA000000A9271**	x	
2	1	**Motor pack for milling cutter**	**3HDA000000A9277**	x	
3	1	**Clamping unit TC 2013**	**3HDA000057A6670**	x	
4	1	**V-block TC 2013**	**0.743.800.040**	x	
5	1	**spacer plate** torch-dependent replacement part Gas nozzle Ø 16 mm to Gas nozzle Ø 16 mm	**0.746.124.001** to **0.746.124.019**	x	
6	1	**Spray nozzle screen**	**3HDA000057A4597**	x	
7	1	**Milling cutter** (torch-dependent wearing part)	**torch-dependent**		x
8	1	**Throttle hollow screw** **G1/8" - Type C** Article No 304005-3 ITV GmbH	**3HDA000057A5344**	x	
9	1	**Filter regulating valve** **LFR-1/8-D-7-MINI** Festo AG & Co. KG	**3HDA000057A5023**	x	
10	1	**Oiler** **LOE-1/8-D-MINI** Festo AG & Co. KG	**3HDA000057A5022**	x	
11	1	**Solenoid valve** **VSVA-B-M52-MD-D1-1R5L** Festo AG & Co. KG	**3HDA000057A5014**	x	
12	1	**Solenoid valve** **MDH-3/2-24DC** Festo AG & Co. KG	**3HDA000057A5015**	x	
13	1	**Connecting line** **NEBU-M12W5-K-0.5-N-LE3** Festo AG & Co. KG	**3HDA000057A5229**	x	
14	1	**Socket** **KMC-1-24DC-25-LED** Festo AG & Co. KG	**3HDA000057A5040**	x	
15	1	**Sensor holder** **SMBZ-8-125/320** Festo AG & Co. KG	**3HDA000057A5095**	x	
16	1	**Sensor** **SME-8M-DS-24V-K-2.5-OE** Festo AG & Co. KG	**3HDA000057A5094**	x	
17	1	**Sensor** **CBN10-F46-E2** Pepperl+Fuchs GmbH	**3HDA000057A5153**	x	
18	1	**Screw-in silencer** **"Legris" G1/4 - 0670 00 13** Parker Hannifin GmbH	**3HDA000057A5027**	x	

Pos.	Qty	Name	ABB Article No	Spare part	Wearing part
19	1	**Miniature silencer** **"Legris" G1/8 - 0677 00 10** Parker Hannifin GmbH	**3HDA000057A5155**	x	
20	1	**Cable** **14G 0.5mm²** HELUKABEL GmbH	**3HDA000057A5224**	x	
21	1 litre	**Release agent - 3850** (in original container)	**0.743.505.003**		x
22	1	**Adjusting injector for reference points**	**0.746.335.025**	x	
23	1	**Protective sleeve for adjusting syringe**	**0.746.335.026**	x	

2.8.2 TC 2013 with wire cutter

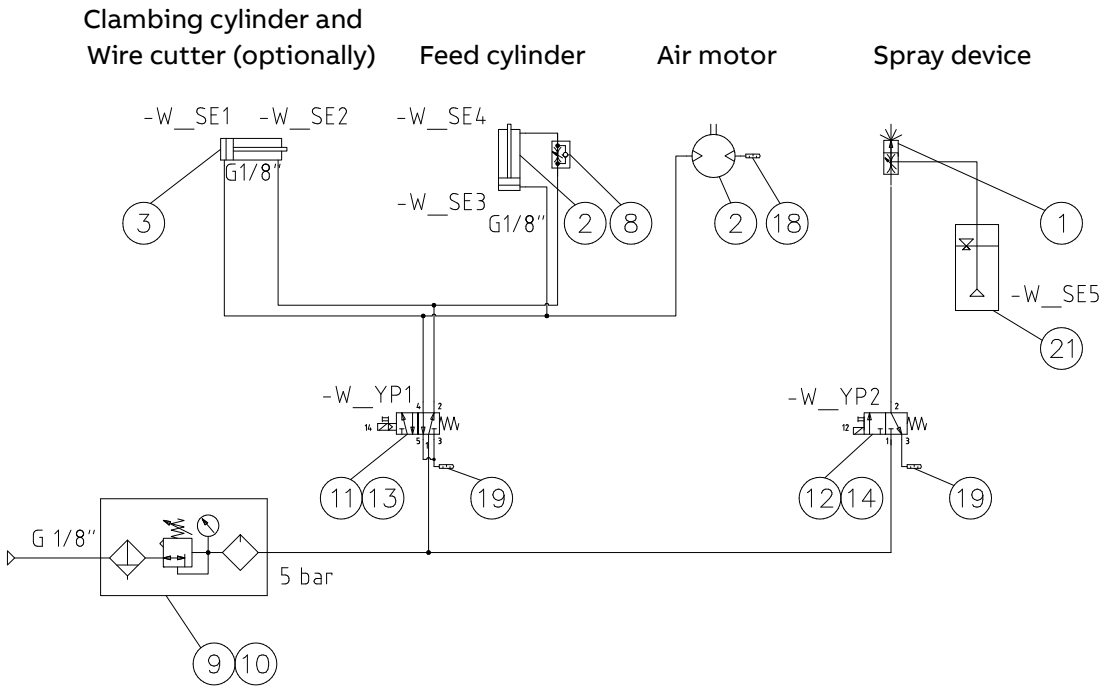




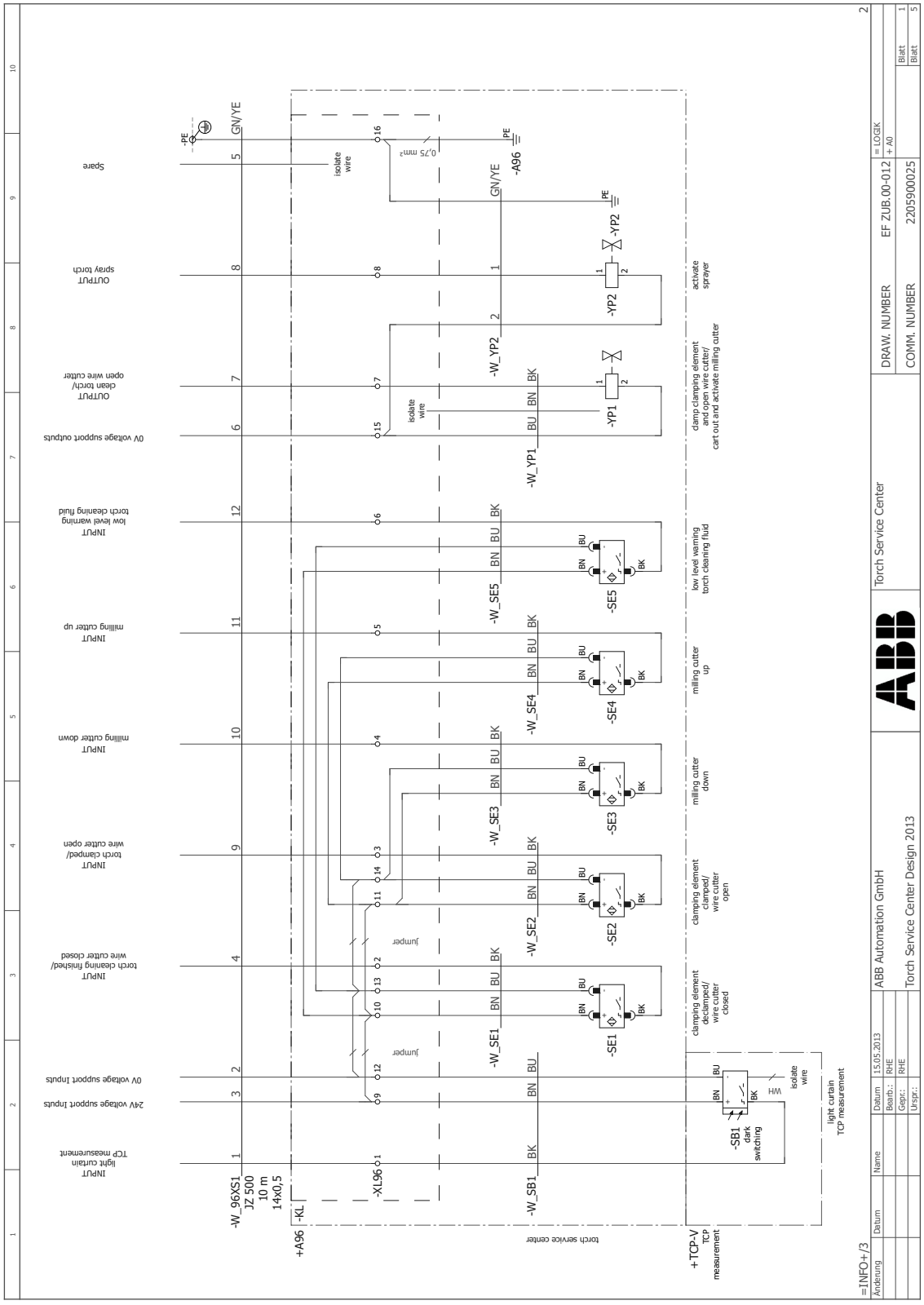
Pos.	Qty	Name	ABB Article No	Spare part	Wearing part
1	1	**Spray head TC 2013**	**3HDA000000A9271**	x	
2	1	**Motor pack for milling cutter**	**3HDA000000A9277**	x	
3	1	**Wire cutter - TSC 2013**	**3HDA000000A9289**	x	
4	1	**V-block TC 2013**	**0.743.800.040**	x	
5	1	**spacer plate** torch-dependent replacement part Gas nozzle Ø 16 mm to Gas nozzle Ø 16 mm	**0.746.124.001** to **0.746.124.019**	x	
6	1	**Spray nozzle screen**	**3HDA000057A4597**	x	
7	1	**Milling cutter** (torch-dependent wear part)	**torch-dependent**		x
8	1	**Throttle hollow screw** **G1/8" - Type C** Article No 304005-3 ITV GmbH	**3HDA000057A5344**	x	
9	1	**Filter regulating valve** **LFR-1/8-D-7-MINI** Festo AG & Co. KG	**3HDA000057A5023**	x	
10	1	**Oiler** **LOE-1/8-D-MINI** Festo AG & Co. KG	**3HDA000057A5022**	x	
11	1	**Solenoid valve** **VSVA-B-M52-MD-D1-1R5L** Festo AG & Co. KG	**3HDA000057A5014**	x	
12	1	**Solenoid valve** **MDH-3/2-24DC** Festo AG & Co. KG	**3HDA000057A5015**	x	
13	1	**Connecting line** **NEBU-M12W5-K-0.5-N-LE3** Festo AG & Co. KG	**3HDA000057A5229**	x	
14	1	**Socket** **KMC-1-24DC-25-LED** Festo AG & Co. KG	**3HDA000057A5040**	x	
15	1	**Sensor holder** **SMBZ-8-125/320** Festo AG & Co. KG	**3HDA000057A5095**	x	
16	1	**Sensor** **SME-8M-DS-24V-K-2.5-OE** Festo AG & Co. KG	**3HDA000057A5094**	x	
17	1	**Sensor** **CBN10-F46-E2** Pepperl+Fuchs GmbH	**3HDA000057A5153**	x	
18	1	**Screw-in silencer** **"Legris" G1/4 - 0670 00 13** Parker Hannifin GmbH	**3HDA000057A5027**	x	

Pos.	Qty	Name	ABB Article No	Spare part	Wearing part
19	1	**Miniature silencer** **"Legris" G1/8 - 0677 00 10** Parker Hannifin GmbH	**3HDA000057A5155**	x	
20	1	**Cable** **14G0.5mm²** HELUKABEL GmbH	**3HDA000057A5224**	x	
21	1 litre	**Weld spatter release agent** (in original container)	**0.743.505.003**		x

2.9 Pneumatic plan



2.10 Electrical circuit diagram

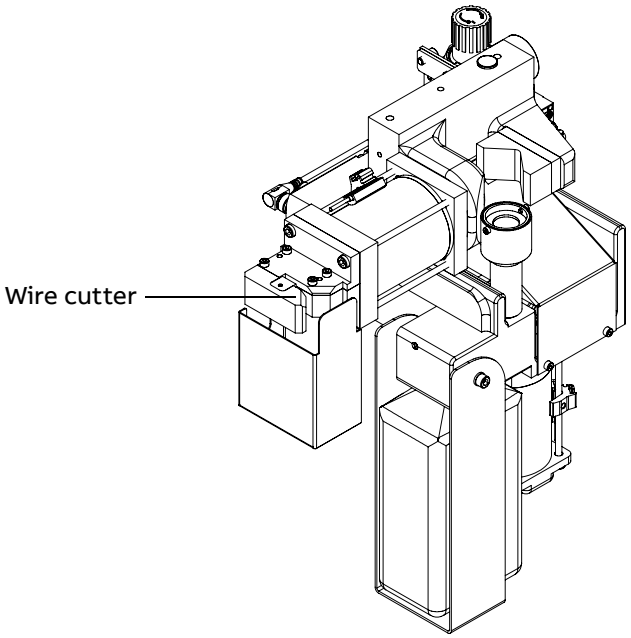


3 Wire cutter

The wire cutter is an option for the TC 2013 and can be retrofitted at any time. A wire cutter conversion cut – Article No 3HDA000057A8405 is needed for this purpose.

Note: The wire cutter is already contained in the TSC 2013 (Torch Service Center).

Figure 3-1 TC 2013 with wire cutter



3.1 Designated use

The wire cutter is used for automatic cutting of the welding wire. It only works on combination with a TC 2013, as it is actuated by the latter.

The wire cutter can be retrofitted on the TC 2013 at any time.

3.2 Technical data

Air pressure	5-10bar		
Clamping cylinder - diameter	45mm		
Stroke	36mm		
Clamping force (at 5 bar)	790N		
Max. welding wire diameter for cutting	d= 1.0mm d= 1.2mm	Steel Aluminium	at minimum **5bar** air pressure
	d= 1.2mm	Steel	at minimum **6bar** air pressure
Weight	approx. 1.5kg		

Supply data

Control voltage	24V DC
Compressed air connection	G 3/8 inch
Compressed air	6 bar unoiled

3.3 Safety instructions

Proceed with the utmost caution when work has to be carried out on the wire cutter (cleaning, replacement of the blades etc.).

Very high forces act in wire cutting as the blades are pressed together using clamping cylinders.

CAUTION

Danger of injury!

Do not place fingers in blades!

3.4 Ignition behaviour / availability of the system

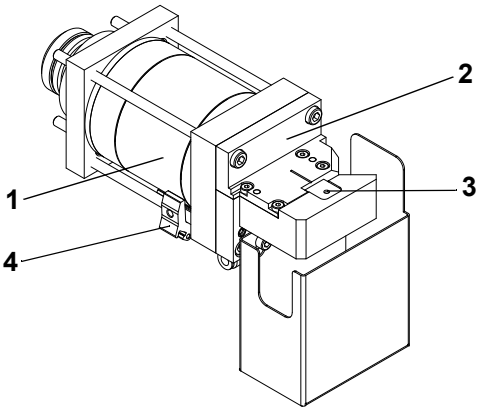
The ignition behaviour and availability of the welding system can be provided by

- cutting off bent or excessive length of emerging wire,
- cutting off the wire end before each torch clean and before each TCP measurement,
- cutting off slag formed at the end of the wire.

3.5 Function and structure

The wire cutter consists of the following components:

1. cylinder, complete (already present on the TC 2013),
2. housing, complete with cutting plate, seal and cover
3. piston-side cutting plate, complete with carrier and shaft
4. 2 sensors.



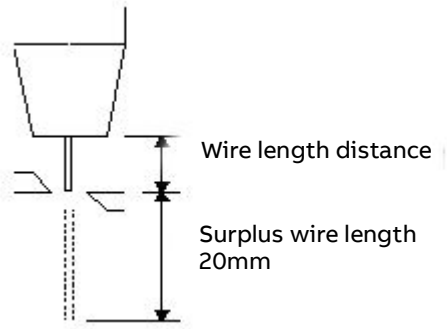
Sequence of operation

The robot is in the cleaning position in this process. The welding torch is generally inside the torch cleaner, above the spray head.

- The blade opens after a wire-cutting program stored in the robot is called. The clamping cylinder therefore also closes automatically, as the two motions are linked.

- The welding torch runs to the desired wire length distance (e.g. 10 mm) above the knife into the wire-cutting position of the torch cleaner.
- The wire feed advances a welding wire surplus length of **at least 20 mm**!

  (A surplus wire length of at least 20 mm is necessary to avoid interfering with operation due to wire waste.)

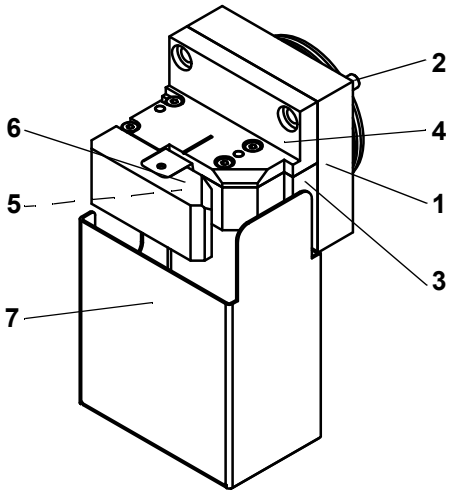


- The knife closes and cuts the welding wire to the desired wire length distance. The knife and clamping cylinder are then back in their home position.

3.6 Assembly of the wire cutter on the TC 2013

If a wire cutter is subsequently to be installed on the TC 2013, a "wire cutter conversion kit" (Article No 3HDA000057A8405) is needed, consisting of:

1. lid
2. drive shaft
3. housing
4. cover
5. carrier for blade
6. cutting plate set
7. wire capture container



3.6.1 Preparations

The following are needed for assembly of the wire cutter on the TC 2013:

– 1 set of Allen keys

– 1 open-end wrench (wrench width 10 mm).

– Thread locker ("LOCTITE 243" or "PETEC thread locker Supersolid"/article no. 930250).

CAUTION

Before reconstructing, make sure that the air and power supplies are disconnected!

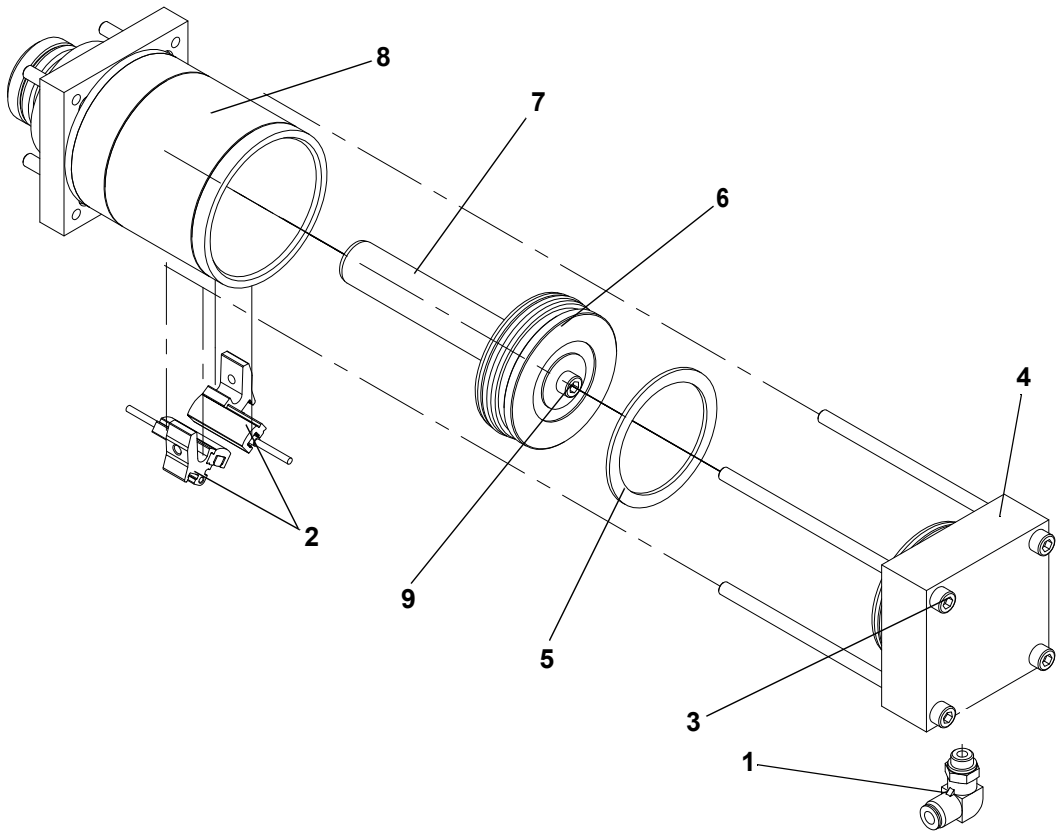
It is recommended that the TC 2013 should be cleaned prior to the conversion.

3.6.2 Disassembly of clamping cylinder

Slight reconstructions are to be carried out in order to be able to install the wire cutter on the TC 2013. Existing components are partly replaced by new ones.

The following steps are to be performed:

Figure 3-2 Disassembly of clamping cylinder



1. Make system pressureless and secure against switching back on.
2. Detach air hose from push-in fitting **(1)** and unscrew push-in fitting. This is needed again for the wire cutter.
3. Unscrew sensors **(2)** together with the clamping holders and protect against unintentional tearing-off.
4. Detach and remove 4 cheese-head screws M6x130 **(3)**. These are needed again for the wire cutter.
5. Pull off lid **(4)** including O-ring. These parts are no longer needed.

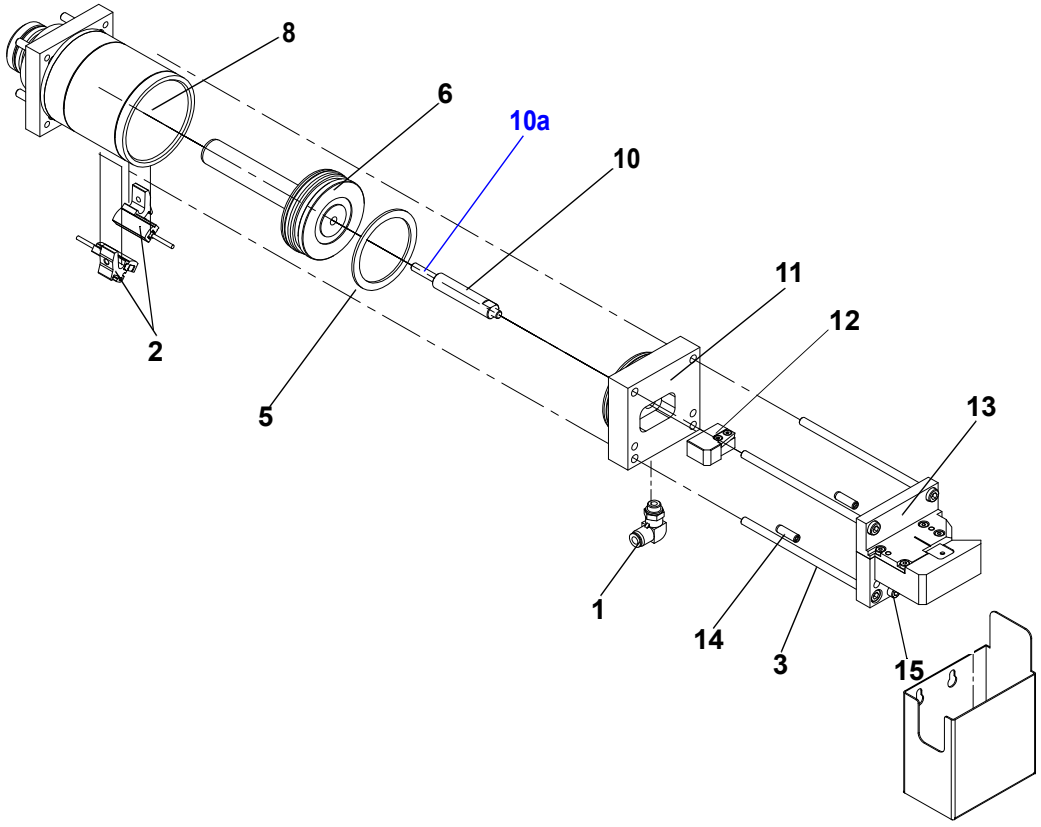
6. Push/pull out cushion disc **(5)** and combined piston **(6)** with piston rod **(7)** from the cylinder tube **(8)**.
7. Remove socket screw M6x30 **(9)** from the piston and instead attach the combined piston **(6)** with shaft **(10)** on the piston rod.

3.6.3 Assembly of wire cutter

NOTICE

Before installing the wire cutter, the threads of the shaft (10a) must always be coated with a thread locker, e.g. "LOCTITE 243" or "PETEC thread locker Supersolid" (article no. 930250)!

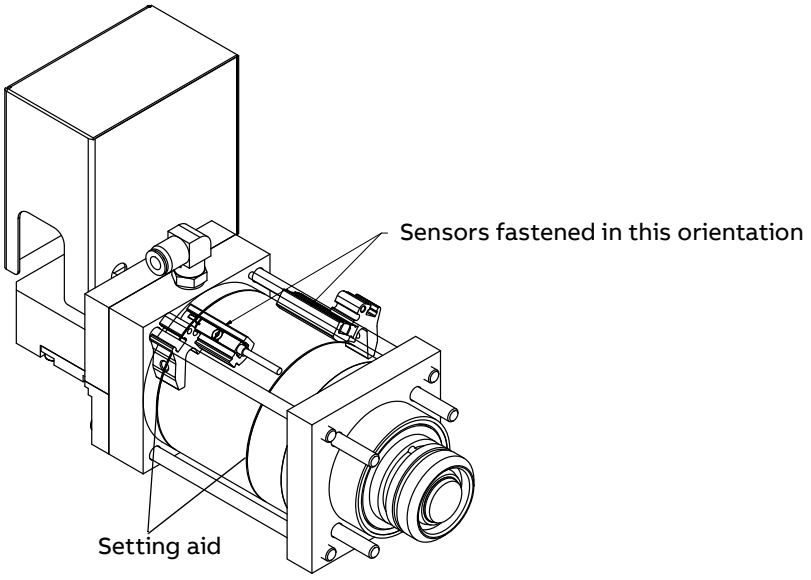
Figure 3-3 Assembly of wire cutter



8. Guide piston rod **(6)** and shaft **(10)** lightly oiled into the cylinder tube **(8)** and through the adapter with wiper and O-ring.
9. Push cushion disc **(5)** and lid **(11)** into the cylinder tube. It should be ensured that the O-rings (12x3 and 60x3) are assembled.
10. Screw blade carrier **(12)** together with the cutting plate at the bottom onto the shaft.
11. Screw housing **(13)**, cover and cutting plate at the top. Then push the blade carrier **(12)** and rotate the piston so that the blade carrier is upright.

12. Screw casing and cover with screws **(3)** and dowel pins **(14)** on the lid **(11)** of the wire cutter.
13. Attach sensors **(2)** together with the clamping holders at the lower screws and position using the setting aid on the cylinder tube.

Figure 3-4 Setting aid for sensors (view from below)



14. Assemble push-in fitting **(1)** and insert air hose.
15. Screw in screws M5x10 **(15)** into the housing of the wire cutter but tighten only such that the wire capture container can be suspended.
16. Carry out function test. In doing so, ensure in particular that compressed air is blown out and the sensors switch correctly (piston away, clamping / piston back, wire cutting). As a test, also let a piece of welding wire be cut.

3.7 Corrective and preventive maintenance

Regular corrective and preventive maintenance should be performed to guarantee operation of the wire cutter. The following activities are recommended:

Maintenance table

Interval	Activity
daily	Visual inspection
	Empty wire collecting tank
weekly	Clean unit of dirt and chips in the area of the blades with a brush. Do not use compressed air.
	Replace blunt cutting plates at the right time.
	Regularly check the level of oil in the oiler of the TC 2013 torch cleaner and top up.
monthly	Test emergency stopping devices for function.

4 TCP gauging (BullsEye®)

4.1 General

You obtain TCP gauging as

- individual device (for ceiling assembly or as option for retrofitting on TC 2013),
- as individual device with stand (standalone version),
- integrated in the TC 2013 or
- integrated in the TSC 2013.

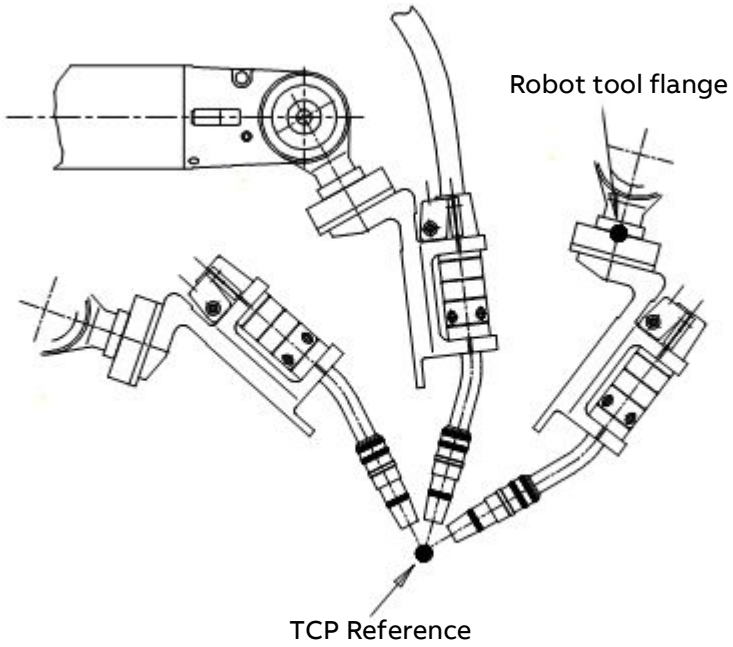
4.1.1 Designated use

The TCP gauging unit is intended solely to measure and adjust the robot tool center point (TCP)

4.1.2 TCP (tool center point)

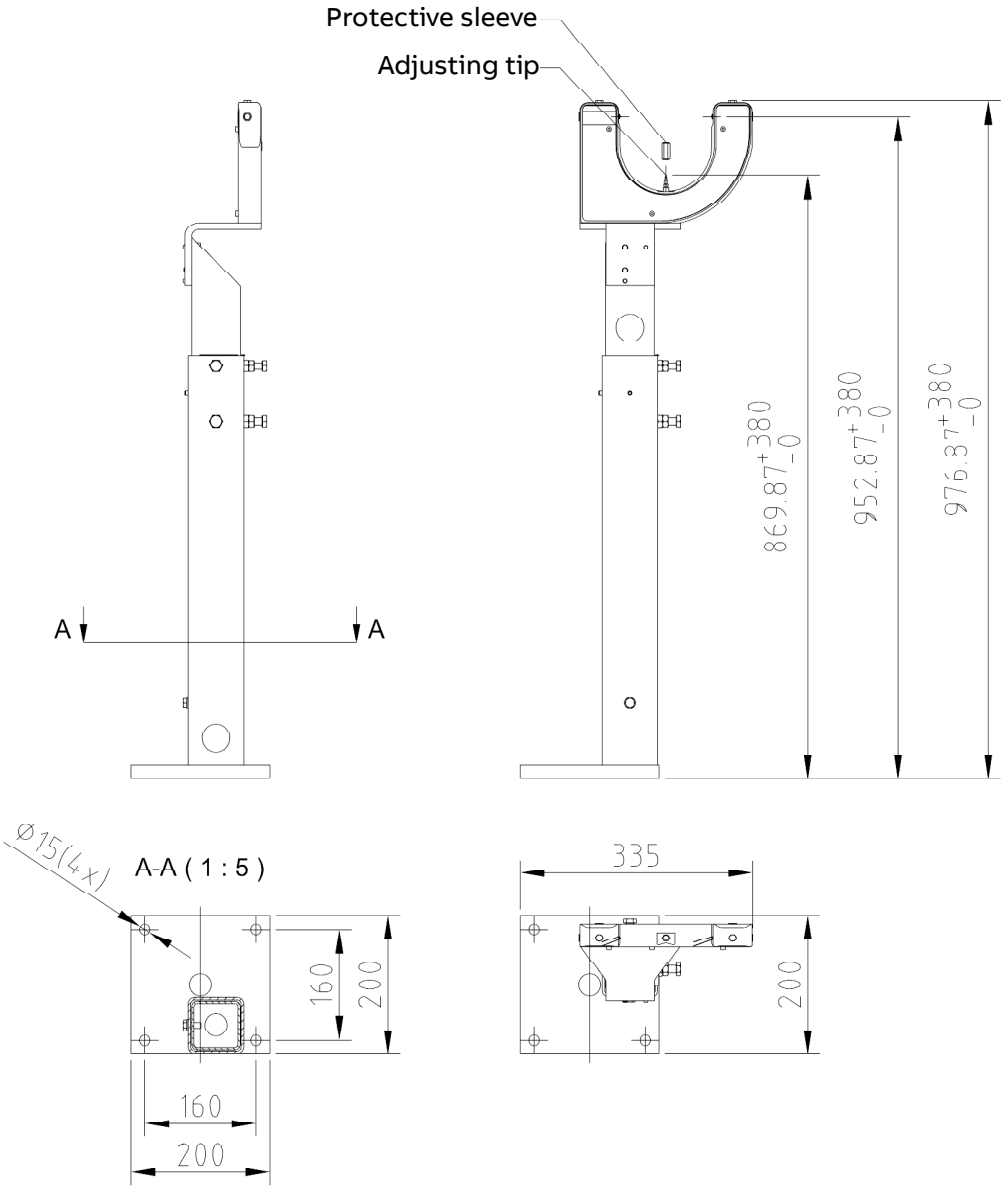
The tool position of an industrial robot is described through what is known as its TCP (tool center point). This is the imagined reference point located at a suitable place on the tool, precisely where the tip of the welding wire would touch the workpiece if a predefined distance (stick-out length of the welding wire) from the base surface of the gas nozzle is used. All programmed positions of the robot relate to the TCP.

Figure 4-1 The welding torch is oriented around the entered TCP.



4.2 Technical data

4.2.1 Dimensions



4.2.2 Connection data electrics

Electrical connection	40mA, at 24VDC
Connection of robot	digital sensor input

4.2.3 System requirements

TCP software	from BullsEye 10
RobotWare	from version 5.06
Digital input	at least 1 free input
RobotWare options	Arc, BullsEye®

4.3 Safety

WARNING

Observe the safety instructions in Chapter 1 Torch Service Center - TSC 2013.

CAUTION

Danger due to piercing!

The protective sleeve must always be placed on the adjusting tip in work on TCP gauging.

4.4 Features of TCP gauging

The robot checks the TCP at fixed intervals of time. Seam displacement due to torch misalignments etc. can consequently be minimised.

Further advantages of regular TCP gauging are:

- reduction of costs in manufacturing,
- greater reproducibility,
- minimisation of time-consuming and expensive re-programming of components,
- monitoring of the robot, error message appears if the calibration of the robot is no longer correct or the TCP gauging has lost its original position.

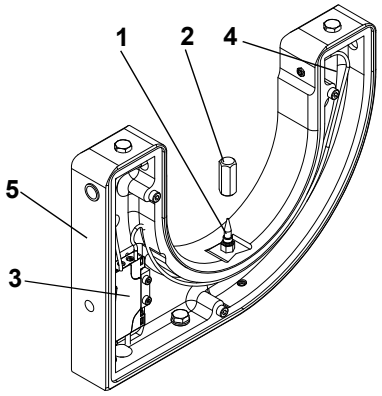
4.5 Structure and function

4.5.1 TCP gauging as standalone device

Standalone TCP gauging can be installed either on the ceiling of a robot cell or retrofitted as an addition to the TC 2013.

TCP gauging consists of the following components:

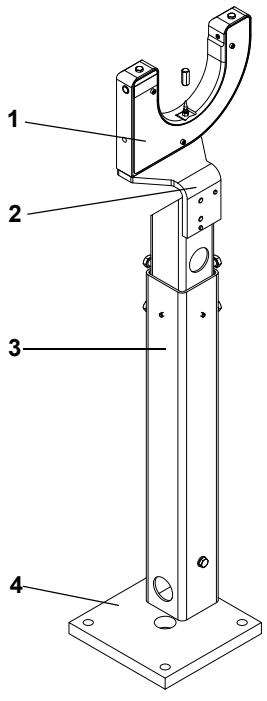
1. adjusting tip
2. protective sleeve for adjusting syringe
3. fibre-optic sensor
4. fibre-optic
5. housing



4.5.2 TCP gauging with stand

TCP gauging **(1)** is mounted on a stand **(3)**, available as a standalone version. A holding angle **(2)** is provided to attach the TCP gauging unit on the stand. The TCP gauging unit is screwed and pinned with the baseplate **(4)** on the workshop floor or on the floor of the robot cell.

1. TCP gauging (complete)
2. holding angle
3. height-adjustable stand
4. baseplate



4.6 Functional description

TCP gauging with BullsEye® version 10 allows completely automatic definition of the tool center point (TCP) for IRC robot control.

4.6.1 Examples of operation

When a robot receives the command to rotate about the TCP all the robot axes are moved such that the TCP remains stationary.

If the torch is damaged and the program is executed again, the robot performs the same movements, but the TCP no longer moves on the same trajectory because of the incorrect alignment.

You then have 2 options:

1. physical moving of the torch in order to align it correctly (a difficult, if not impossible task!) or
2. automatic correction of the incorrect alignment, the TCP being redefined according to the new torch position with BullsEye®. After BullsEye® has updated the TCP position, the torch rotates about the TCP as previously, because the trajectory of the robot arm was adapted in order to offset the incorrect alignment of the torch.

After a point has been programmed the angles of the robot joints are not stored in the robot but the data of the position of the tool center point.

If the robot repeats the programmed trajectory, it calculates the joint angles necessary so that the TCP is back in the position it was at in the original programming of the trajectory.

As long as the robot control has information on the position of the tool center point it ensures proper alignment of the trajectories.

Figure 4-2 Movement of robot arm and torch with correct TCP

Figure 4-3 Robot arm moves on the same trajectory, however the torch trajectory has changed

4.6.2 TCP deviation

Component programming is normally undertaken with an adjusted TCP. The adjusted TCP may deviate from the actual TCP due to faults in operating sequence.

TCP deviations may have the following causes:

– collision with a component clamp,

– no wire free-burn at the seam end

– adjustable torch holder,

– contact tube wear or highly modified pre-dressing of the welding wire.

The consequence is seam displacements in the components. To correct the seam positions the TCP must be re-adjusted.

There are various options for this:

4.6.2.1 Manual TCP adjusting method

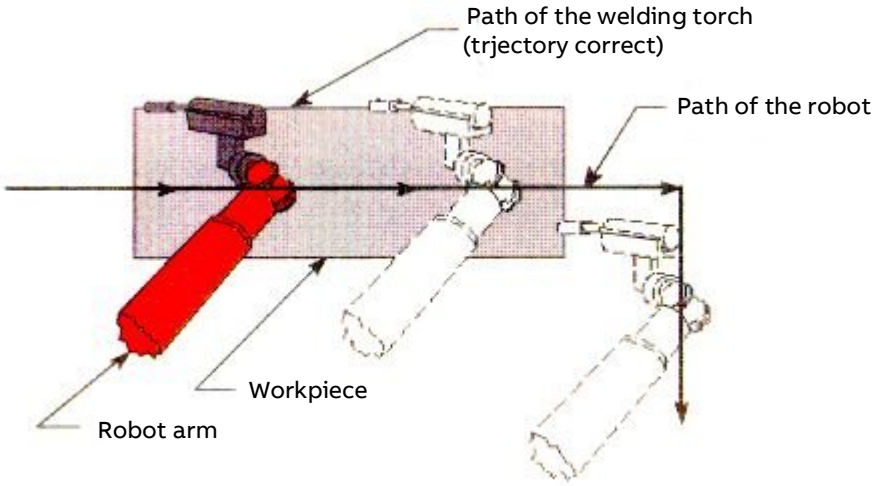
- Manual alignment in a mechanical torch gauge.
- Manual alignment via two adjusting tips.
- Manual gauging, using programming device.

Further information on manual gauging can be found in the user manual on robot control.

4.6.2.2 Program correct by TCP calibration

- Automatic re-adjustment of the welding wire in a measuring beam.
- Motion program for the robot as software module.

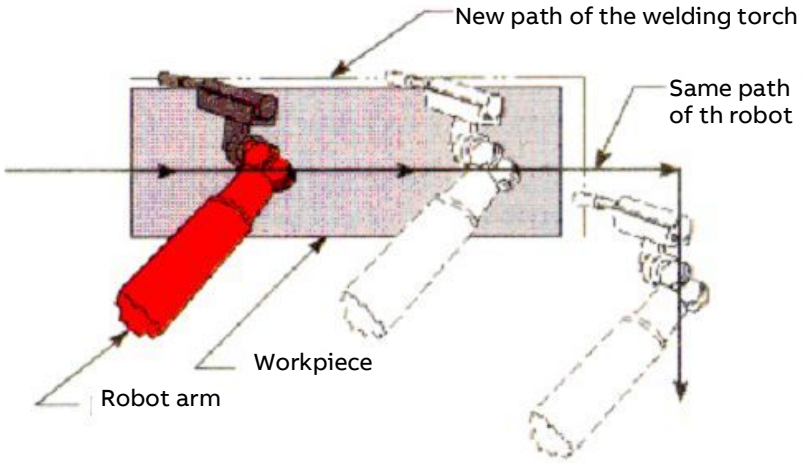
Figure 4-4 Robot and torch motion with correct TCP



If a position is saved, this is always done using the current tool and taking account of the current axial angle. These angles are always run in the program sequence.

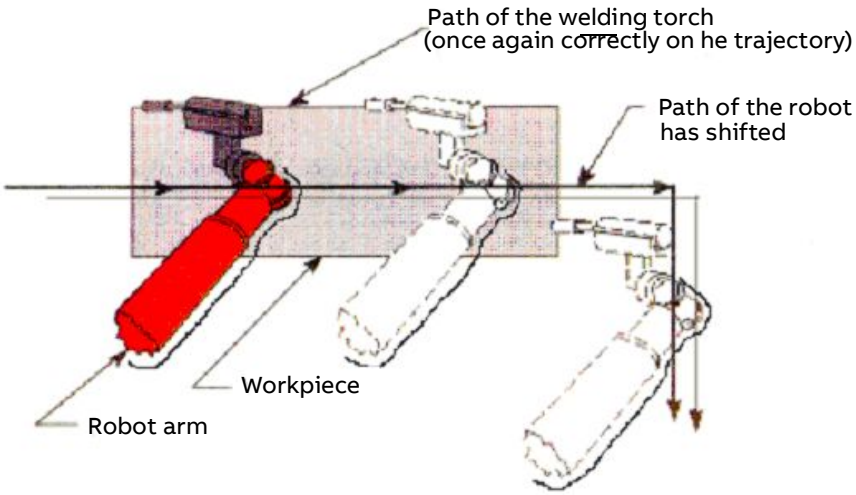
If the tool center point (TCP) is no longer in the defined position due to a change, the welded seam is away by the dimensional deviation of the write electrode tip from the defined TCP. This is shown by Figure 4-5.

Figure 4-5 Deviation from the programmed trajectory



The tool is re-measured by the automatic TCP gauging. The welding gun then runs the correct trajectory on the component.

Figure 4-6 The TCP was corrected



The welding gun runs the correct path again (the axial configuration of the robot has changed).

4.7 Assembly

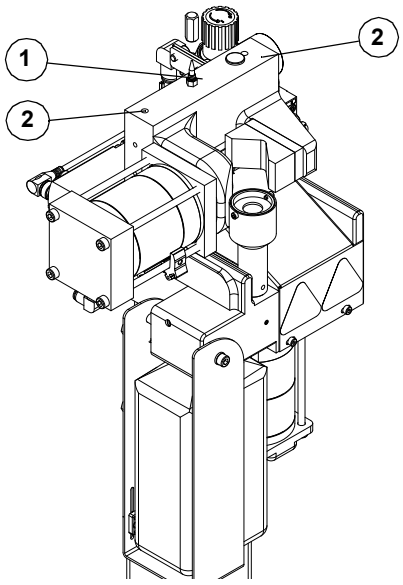
4.7.1 Subsequent assembly on the TC 2013

The TCP gauging can be retrofitted on the TC 2013 at any time.

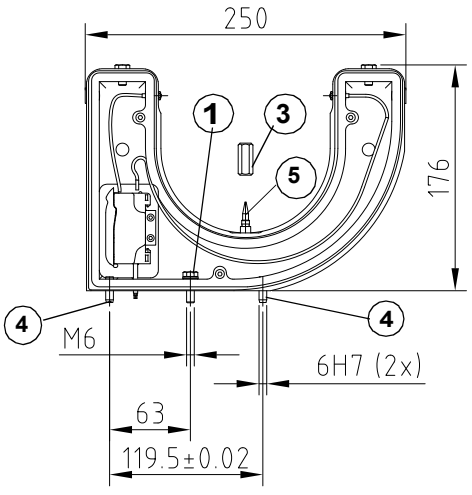
WARNING

Before assembly and installation work the system must be electrically dead and pressureless and protected against being switched back on.

1. It should be verified before starting assembly that the protective sleeve **(3)** is in position on the adjusting tip! **(5)** . If not, put the protective sleeve on (danger of piercing).
2. Place the TCP gauging unit on the TC 2013 so that the two pins **(4)** rest in the holes provided **(2)**.
3. Then secure with 1 screw M6x12 **(1)**



4. Then attach the two pins **(4)**.



CAUTION

The electrical connection must be carried out according to the connection diagram (Fig. 4-7).

4.7.2 Assembly of TCP gauging with stand

NOTICE

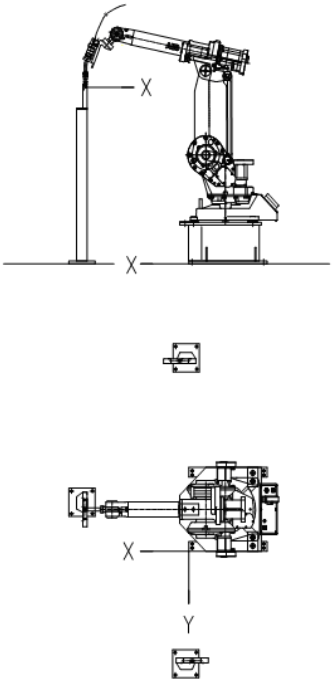
In assembling the TCP gauging unit with stand (stand-alone version), proceed as described in Section 2.4 Assembly and disassembly of the TC 2013.

4.7.3 Assembly site and alignment

Assemble the welding gun on the robot so that the torch axis points in the X-direction of the wrist.

The installation site of the TCP gauging unit must be in the working range of the robot so that no singularity and end positions of the robot are reached.

Place the TCP gauging unit at the desired place in front or alongside the robot. Do not yet fasten, but secure against tipping over!



It is optionally possible to install the TCP gauging unit suspended (e.g. from the cell ceiling).

The direction of the sensor should be aligned parallel to the robot base coordinates system in the x- or y-direction. The y-axis of the write coordinates system on the robot should always be parallel to the direction of the light barrier. This specification also results in alignment of the TCP gauging unit to the robot base coordinates system.

The assembly site in the robot working range must be selected so that rotation about the torch axis of at least 30° is possible. Greater accuracy is provided by 45° rotation, which should preferably be selected in the setup.

4.7.3.1 Electrical installation

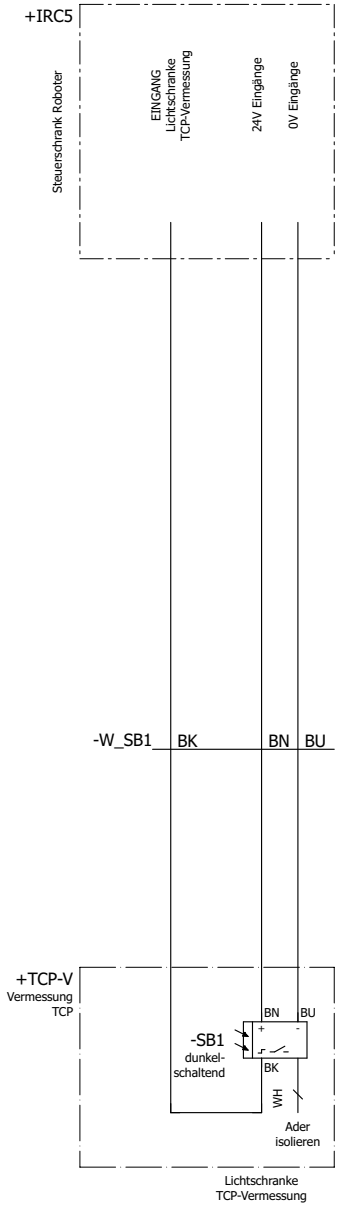
WARNING

Electrical installation must only be performed by qualified personnel!

To simplify assembly, the TCP gauging unit is supplied pre-assembled and with a connecting cable. Connect the cable supplied from the robot control with the connection on the TCP gauging unit (BullsEye®). The position of the device alongside or in front of the robot depends among other things on the assembly of the welding gun on the wrist and is only fixed after a test run.

Carry out the connection according to the following connection diagram.

Figure 4-7 Connection diagram: TCP gauging unit



4.8 Using for the first time

4.8.1 General

Before operating for the first time it should be checked that

- all components are correctly assembled and attached,
- all electrical connections are correctly made,
- the functioning of all safety devices has been ensured.

WARNING

Danger from incorrect connections/settings and non-functioning/missing safety devices!

4.8.2 Installation of Software BullsEye®10

The software option BullsEye® 10 is automatically made available to all welding robots when the baseware (robot operating system) is installed. This is conditional on the option "BullsEye®" in the keystring being present for the control module. BullsEye® 10 is not available available as a standalone option on CD.

Further information on use of BullsEye® software can be found in the BullsEye® user manual.

4.8.3 EIO Configuration

For DeviceNet or EtherNet/IP Local IO, the configuration of system parameters for the I/O is set up automatically when loading the software. If a manual configuration is done, make sure the parameter Connection Type is set to Change-Of-State (COS) connection to get the most accurate measurement.

How do I set up a non-ABB supplied I/O device?

Only ABB I/O devices are guaranteed to work with BullsEye. Many I/O devices from other vendors are too slow or too unrepeatable to allow BullsEye to work correctly. When using non-ABB devices, you may need to slow the scan speed substantially to improve accuracy.

A DeviceNet device from WAGO, for example, may be used in the COS (Change of State) mode, but the PIT (Production Inhibit Time) should be reduced as much as possible, preferably to zero. Both is done in the system parameters in the topic I/O, of type DeviceNet Device.

4.9 Operation

TCP gauging is controlled by the robot. The program sequence for TCP gauging is contained in the robot program.

4.9.1 Switching on

When robot control is switched on, the TCP gauging unit is also ready for operation.

CAUTION

Danger of electric shock!

Make sure that all live components are properly covered.

4.9.2 Function test

A function test is to be performed before using the TCP gauging unit for the first time. The function test is to be performed in manual mode.

CAUTION

Tests must only be performed by qualified personnel.

1. Check that the digital input, which is connected to the TCP gauging unit, responds properly. To do so, check that the signal is defined on an I/O card as input.
2. Place your hand through the beam of the TCP control unit, to interrupt the beam. The LED for the input on the I/A card must light up if the beam is interrupted. If this is not the case, check that the E/A card and the connections are properly configured.

4.10 Maintenance

TCP gauging is supplied ready for use and apart from cleaning of the device requires extremely little maintenance work.

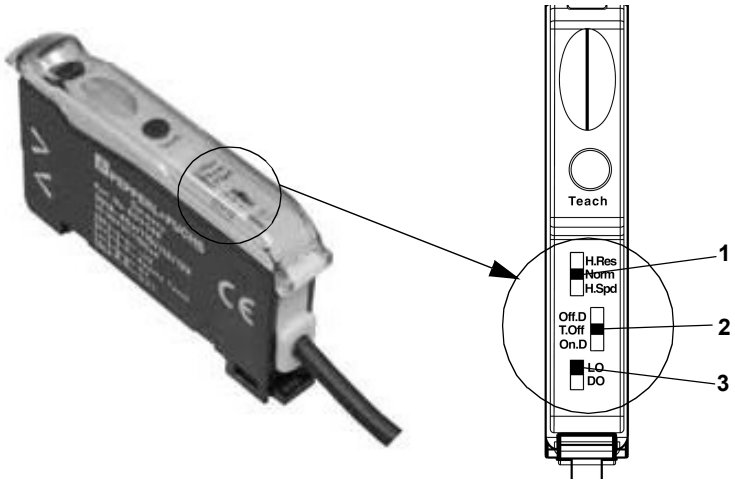
Maintenance table

Interval	Activity
daily	Visual inspection
as needed	Clean light entry/exist surfaces with a clean cloth.
as needed	Replacement of the fibre-optic sensor if this is defective

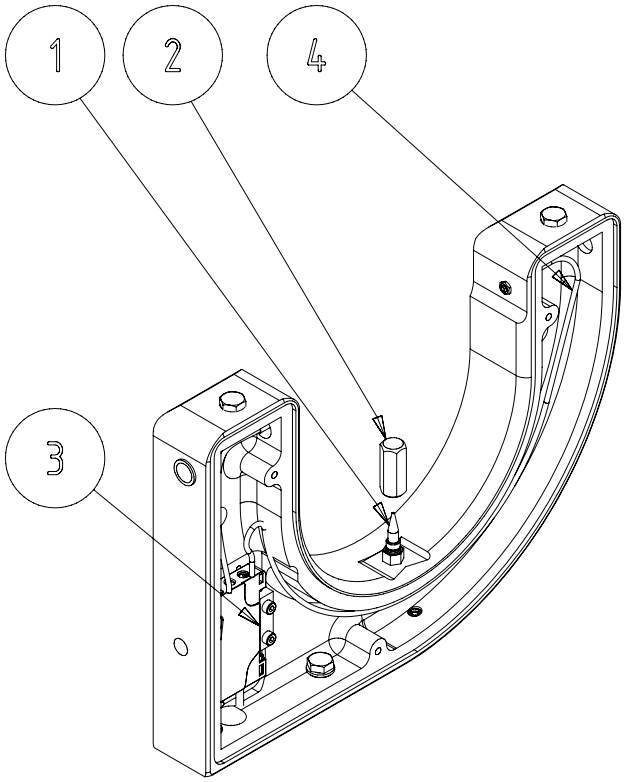
Replacement of the sensor

If the fibre-optic sensor of TCP gauging is to be replaced due to a defect, it should be ensured that the 3 switches on the senor are in the illustrated position.

Pos.	Switch position
1	Standard
2	T.Off
3	LO



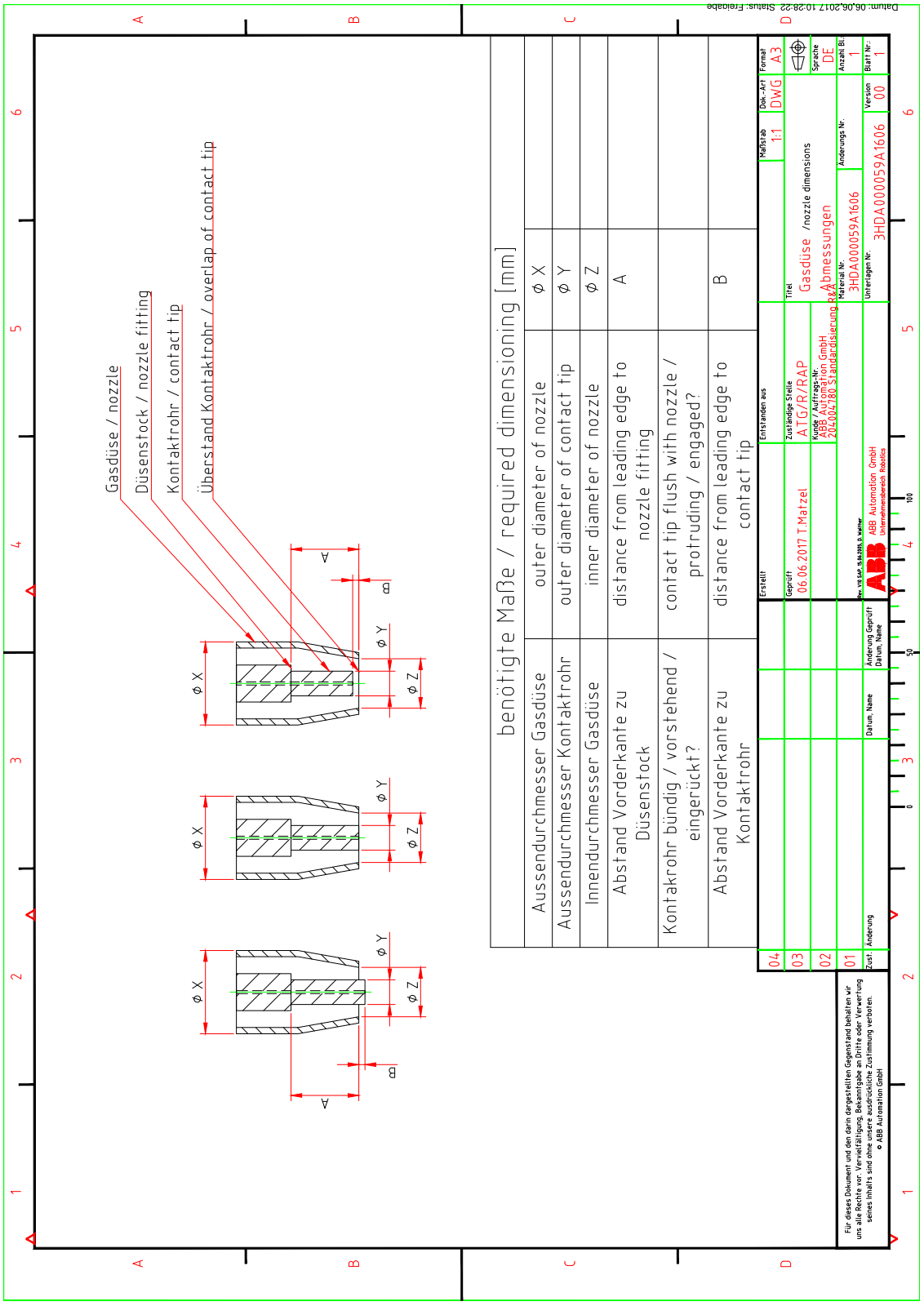
4.11 Spare parts



Pos.	Quantity	Name	ABB article number
		TCP gauging (BullsEye®)	3HDA000000A9324
1	**1**	Adjusting tip for reference points	0.746.335.025
2	**1**	Protective sleeve	0.746.335.026
3	**1**	Fibre-optic sensor SU18-40A/110/115/126A Pepperl+Fuchs GmbH	3HDA000057A5166
4	**1**	Fibre-optic KLE-C01-2,2-2,0-K103 Pepperl+Fuchs GmbH	3HDA000057A5175
Optional:			
	1	**TCP gauging complete with stand**	3HDA000057A5435

5 Appendix

5.1 Dimension sheet Gas nozzle



Dimension sheet Gas nozzle

5.2 Safety Data Sheet Release Agent AS 72-K

After cleaning, the gas nozzle should be sprayed with the release agent AS 72K.

NOTICE

No safety data sheet is required for this product in accordance with article 31 of the REACH ordinance (EC) No 1907/2006.

The release agent AS 72-K is not dangerous goods according to the transport regulations.

The safety data sheet is provided to the information arrangement for the simplification.

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SECTION 1: Identification of the substance/mixture and of the company/ undertaking

1.1. Product identifier

Trade name/designation:

AS 72-K

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture:
Plating agent

1.3. Details of the supplier of the safety data sheet

Supplier (manufacturer/importer/only representative/downstream user/distributor):

Jost Chemicals GmbH
Gottlieb-Daimler-Str. 10
69514 Laudenbach
Germany

Telephone: 0049-6201-42810
Telefax: 0049-6201-45590
E-mail: info@jost-chemicals.de
Website: www.jost-chemicals.de

1.4. Emergency telephone number

R&D Jost Chemicals, 24h: +49-(0)157-73741921, +49-(0)6201-42810 (Only available during office hours.)

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008 [CLP]:
The mixture is classified as not hazardous according to regulation (EC) No 1272/2008 [CLP].

2.2. Label elements

Labelling according to Regulation (EC) No. 1272/2008 [CLP]
According to EC directives or the corresponding national regulations the product does not have to be labelled.

Hazard statements: -
Supplemental hazard information: -

2.3. Other hazards

No data available

SECTION 3: Composition / information on ingredients

3.2. Mixtures

Description:
Mixture of non-dangerous substances. (Fatty acids and color.)

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Hazardous ingredients / Hazardous impurities / Stabilisers:

product identifiers	Substance name Classification according to Regulation (EC) No 1272/2008 [CLP]	Concen-tration
CAS No.: 67701-30-8 **EC No.:** 266-948-4	**Glycerides, C16-18 and C18-unsatd.** The substance is classified as not hazardous according to regulation (EC) No 1272/2008 [CLP].	≥ 50 – ≤ 60 weight-%
CAS No.: 85586-25-0 **EC No.:** 287-828-8 **REACH No.:** 01-2119471664-32-0000	**Fatty acids, rape-oil, Me esters** The substance is classified as not hazardous according to regulation (EC) No 1272/2008 [CLP].	≥ 45 – ≤ 55 weight-%

SECTION 4: First aid measures

4.1. Description of first aid measures

General information:
In case of accident or unwellness, seek medical advice immediately (show directions for use or safety data sheet if possible). Remove victim out of the danger area. Remove contaminated, saturated clothing. If unconscious but breathing normally, place in recovery position and seek medical advice. Do not leave affected person unattended.

Following inhalation:
No special measures are necessary.

In case of skin contact:
After contact with skin, wash immediately with plenty of water and soap.

After eye contact:
In case of contact with eyes flush immediately with plenty of flowing water for 10 to 15 minutes holding eyelids apart and consult an ophthalmologist.

Following ingestion:
Rinse mouth. Let water be drunken in little sips (dilution effect). Get medical advice/attention if you feel unwell.

4.2. Most important symptoms and effects, both acute and delayed

No known symptoms to date.

4.3. Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media:
Water spray jet alcohol resistant foam Extinguishing powder Carbon dioxide (CO2)

Unsuitable extinguishing media:
Full water jet

5.2. Special hazards arising from the substance or mixture

Hazardous combustion products:
Carbon dioxide (CO2), Carbon monoxide

5.3. Advice for firefighters

In case of fire: Wear self-contained breathing apparatus.

5.4. Additional information

Collect contaminated fire extinguishing water separately. Do not allow entering drains or surface water.

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JOST CHEMICALS

AS 72-K

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Personal precautions:
Avoid breathing dust/fume/gas/mist/vapours/spray. Remove persons to safety.

Protective equipment:
Wear protective gloves/protective clothing/eye protection/face protection.

6.1.2. For emergency responders

Personal protection equipment:
Personal protection equipment: see section 8

6.2. Environmental precautions

Do not allow to enter into surface water or drains.

6.3. Methods and material for containment and cleaning up

For containment:
Absorb with liquid-binding material (sand, diatomaceous earth, acid- or universal binding agents).

6.4. Reference to other sections

Safe handling: see section 7 Personal protection equipment: see section 8 Disposal: see section 13

6.5. Additional information

Use appropriate container to avoid environmental contamination.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Protective measures

Advices on safe handling:
Wear personal protection equipment (refer to section 8).

Fire prevent measures:
Usual measures for fire prevention.

Measures to prevent aerosol and dust generation:
No special measures are necessary.

Environmental precautions:
Do not allow to enter into surface water or drains.

Advices on general occupational hygiene
When using do not eat, drink or smoke. Avoid contact with eyes and skin.

7.2. Conditions for safe storage, including any incompatibilities

Technical measures and storage conditions:
Keep container tightly closed in a cool, well-ventilated place.

Requirements for storage rooms and vessels:
Keep/Store only in original container.

Hints on storage assembly:
Do not store together with: Food and feedingstuffs

Storage class (TRGS 510, Germany): 12 – non-combustible liquids that cannot be assigned to any of the above storage classes

7.3. Specific end use(s)

Recommendation:
Observe technical data sheet.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

No data available

en / EE / TR / AD / PL / PT / ...
GeSi.de

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8.2. Exposure controls

8.2.1. Appropriate engineering controls
No data available

8.2.2. Personal protection equipment
Eye/face protection:
Eye glasses with side protection EN 166

Skin protection:
Tested protective gloves must be worn EN ISO 374 Suitable material: NBR (Nitrile rubber).
Breakthrough times and swelling properties of the material must be taken into consideration.

Respiratory protection:
If technical exhaust or ventilation measures are not possible or insufficient, respiratory protection must be worn.

8.2.3. Environmental exposure controls
No data available

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Appearance
Physical state: Liquid
Colour: greenish blue
Odour: Fatty acid

Safety relevant basis data

parameter		at °C	Method	Remark
pH	≈ 6	20 °C		
Melting point	*not determined*			
Freezing point	*not determined*			
Initial boiling point and boiling range	> 200 °C			
Decomposition temperature	*not determined*			
Flash point	> 200 °C			
Evaporation rate	*not determined*			
Auto-ignition temperature	*not determined*			
Upper/lower flammability or explosive limits	*not determined*			
Vapour pressure	*not determined*			
Vapour density	*not determined*			
Density	≈ 0.9 g/cm³	20 °C		
Relative density	*not determined*			
Bulk density	*not determined*			
Water solubility	*not determined*			
Partition coefficient: n-octanol/ water	*not determined*			
Dynamic viscosity	*not determined*			
Kinematic viscosity	*not determined*			

9.2. Other information
No data available

SECTION 10: Stability and reactivity

10.1. Reactivity
No data available

10.2. Chemical stability
The product is chemically stable under recommended conditions of storage, use and temperature.

10.3. Possibility of hazardous reactions
No data available

10.4. Conditions to avoid
No data available

10.5. Incompatible materials
Oxidizing agent

10.6. Hazardous decomposition products
Does not decompose when used for intended uses.

SECTION 11: Toxicological information

11.1. Information on hazard classes as defined in Regulation (EC) No 1272/2008

Acute oral toxicity:
Based on available data, the classification criteria are not met.

Acute dermal toxicity:
Based on available data, the classification criteria are not met.

Acute inhalation toxicity:
Based on available data, the classification criteria are not met.

Skin corrosion/irritation:
Based on available data, the classification criteria are not met.

Serious eye damage/irritation:
Based on available data, the classification criteria are not met.

Respiratory or skin sensitisation:
Based on available data, the classification criteria are not met.

Germ cell mutagenicity:
Based on available data, the classification criteria are not met.

Carcinogenicity:
Based on available data, the classification criteria are not met.

Reproductive toxicity:
Based on available data, the classification criteria are not met.

STOT-single exposure:
Based on available data, the classification criteria are not met.

STOT-repeated exposure:
Based on available data, the classification criteria are not met.

Aspiration hazard:
Based on available data, the classification criteria are not met.

Additional information:
No data available

11.2. Information on other hazards
No data available

SECTION 12: Ecological information

12.1. Toxicity
No data available

12.2. Persistence and degradability
No data available

12.3. Bioaccumulative potential
No data available

12.4. Mobility in soil
No data available

12.5. Results of PBT and vPvB assessment
No data available

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12.6. Endocrine disrupting properties
No data available

12.7. Other adverse effects
No data available

SECTION 13: Disposal considerations

13.1. Waste treatment methods
Dispose of waste according to applicable legislation.

Waste treatment options

Appropriate disposal / Product:
Consult the appropriate local waste disposal expert about waste disposal. Dispose of waste according to applicable legislation.

Appropriate disposal / Package:
Non-contaminated packages may be recycled.

SECTION 14: Transport information

No dangerous good in sense of these transport regulations.

Land transport (ADR/RID)	Inland waterway craft (ADN)	Sea transport (IMDG)
14.1. UN number or ID number		
No dangerous good in sense of these transport regulations.	No dangerous good in sense of these transport regulations.	No dangerous good in sense of these transport regulations.
14.2. UN proper shipping name		
No dangerous good in sense of these transport regulations.	No dangerous good in sense of these transport regulations.	No dangerous good in sense of these transport regulations.
14.3. Transport hazard class(es)		
not relevant		
14.4. Packing group		
not relevant		
14.5. Environmental hazards		
not relevant		
14.6. Special precautions for user		
not relevant		

14.7. Maritime transport in bulk according to IMO instruments
not relevant

SECTION 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

15.1.1. EU legislation

Other regulations (EU):
Directive 2012/18/EU on the control of major-accident hazards involving dangerous substances [Seveso-III-Directive]: This product is not assigned to a hazard category.

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15.1.2. National regulations

[DE] National regulations

Störfallverordnung

for substances contained in the product:
This product is not assigned to a hazard category.

Water hazard class

WGK:
1 - schwach wassergefährdend

15.2. Chemical Safety Assessment

No data available

SECTION 16: Other information

16.1. Indication of changes

No data available

16.2. Abbreviations and acronyms

No data available

16.3. Key literature references and sources for data

Data arise from reference works and literature.

16.4. Classification for mixtures and used evaluation method according to regulation (EC) No 1272/2008 [CLP]

Classification according to Regulation (EC) No 1272/2008 [CLP]:
The mixture is classified as not hazardous according to regulation (EC) No 1272/2008 [CLP].

16.5. Relevant R-, H- and EUH-phrases (Number and full text)

No data available

16.6. Training advice

No data available

16.7. Additional information

No data available

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