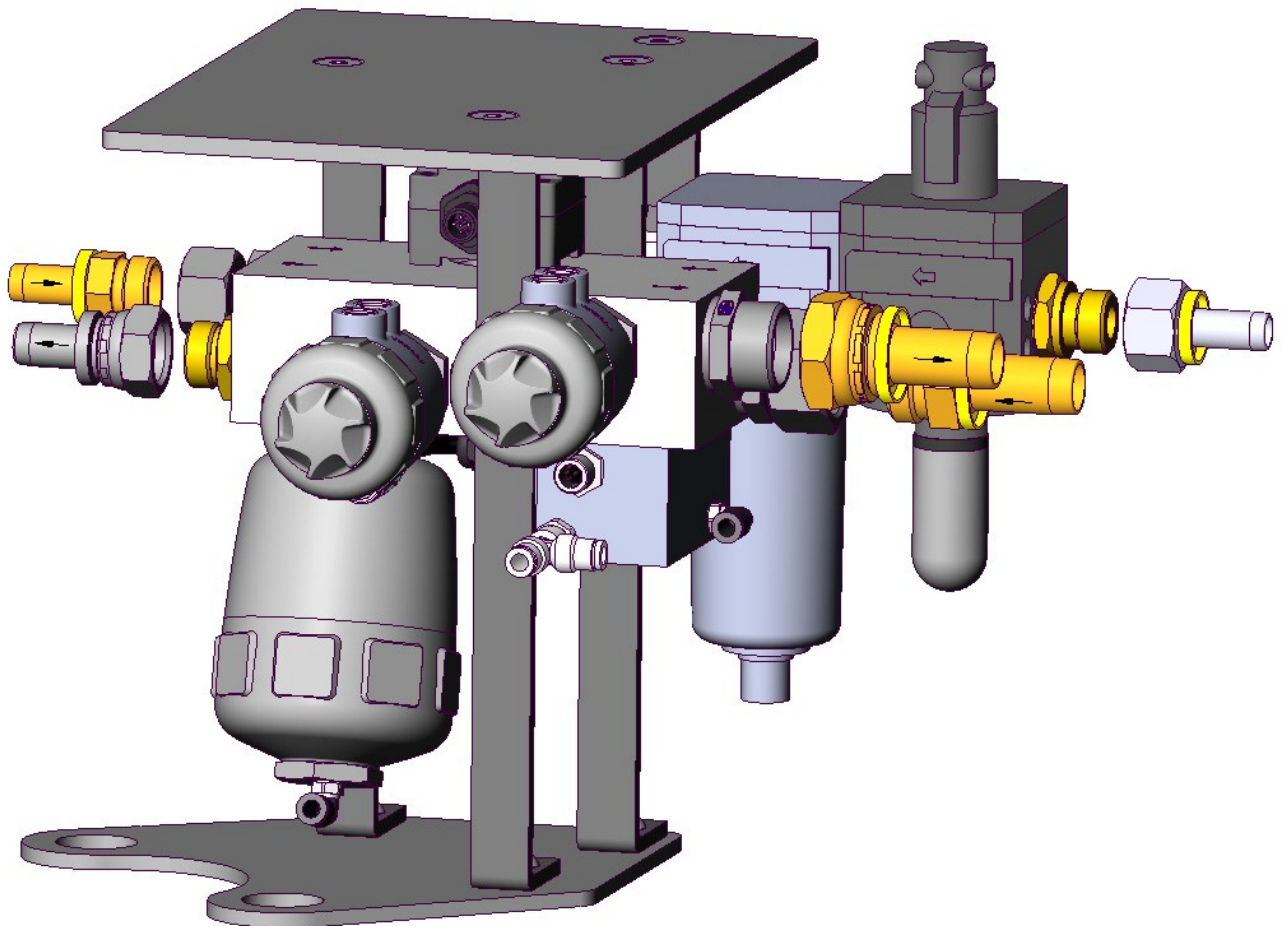


Operating instructions



Type 8821

Master Jet Flow Regulation

Article number: 281436

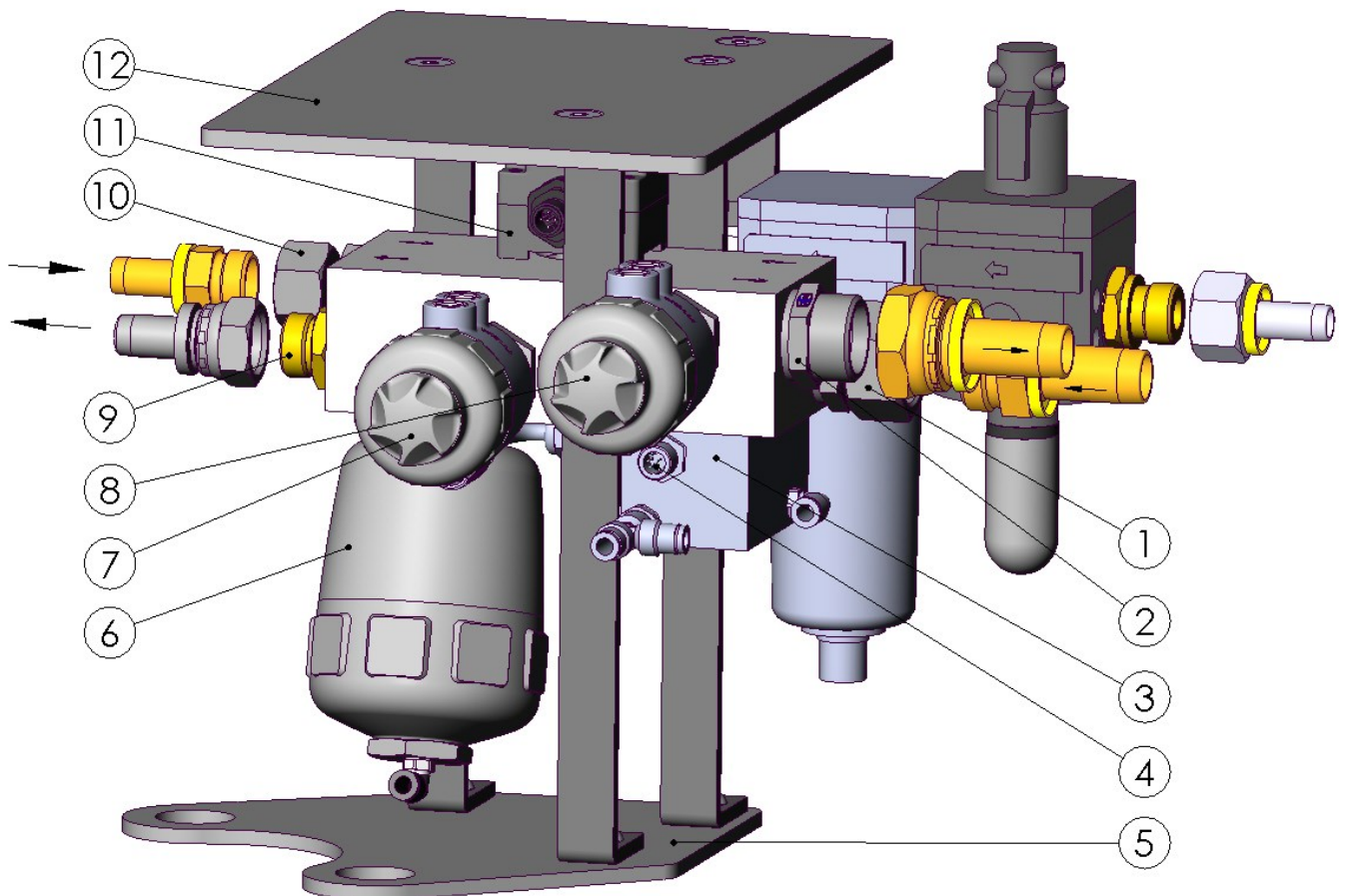
Operating instructions:

© 2016 Bürkert Werke GmbH

Operating instructions 1701/04_EN

Master Jet

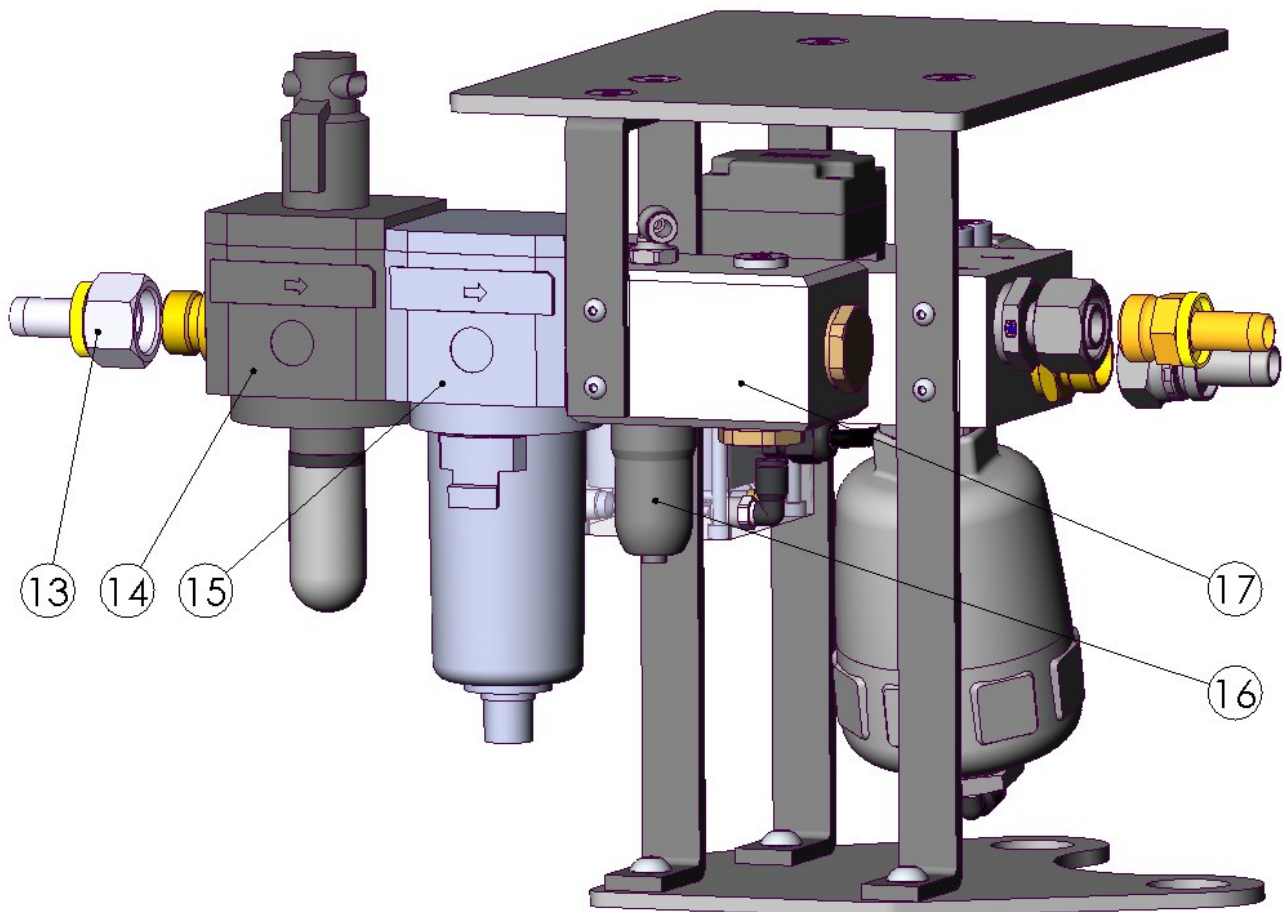
Component overview of cooling water unit



- 1 Sealing head DN20 straight on cooling water unit supply line from plant
- 2 Bulkhead DN20 straight cooling water unit return line from plant
- 3 Control valve unit
- 4 M12 socket to connect process controller
- 5 Mounting plate to attach to robot base *KUKA QUANTEC* series
- 6 Water pressure expansion cylinder
- 7 Proportional control valve in supply line
- 8 Shut-off valve in return line
- 9 Bulkhead DN12 straight cooling water unit supply line on to robot base
- 10 Sealing head DN12 straight cooling water unit return line to robot base
- 11 Impeller flow sensor
- 12 Step protection plate

Master Jet

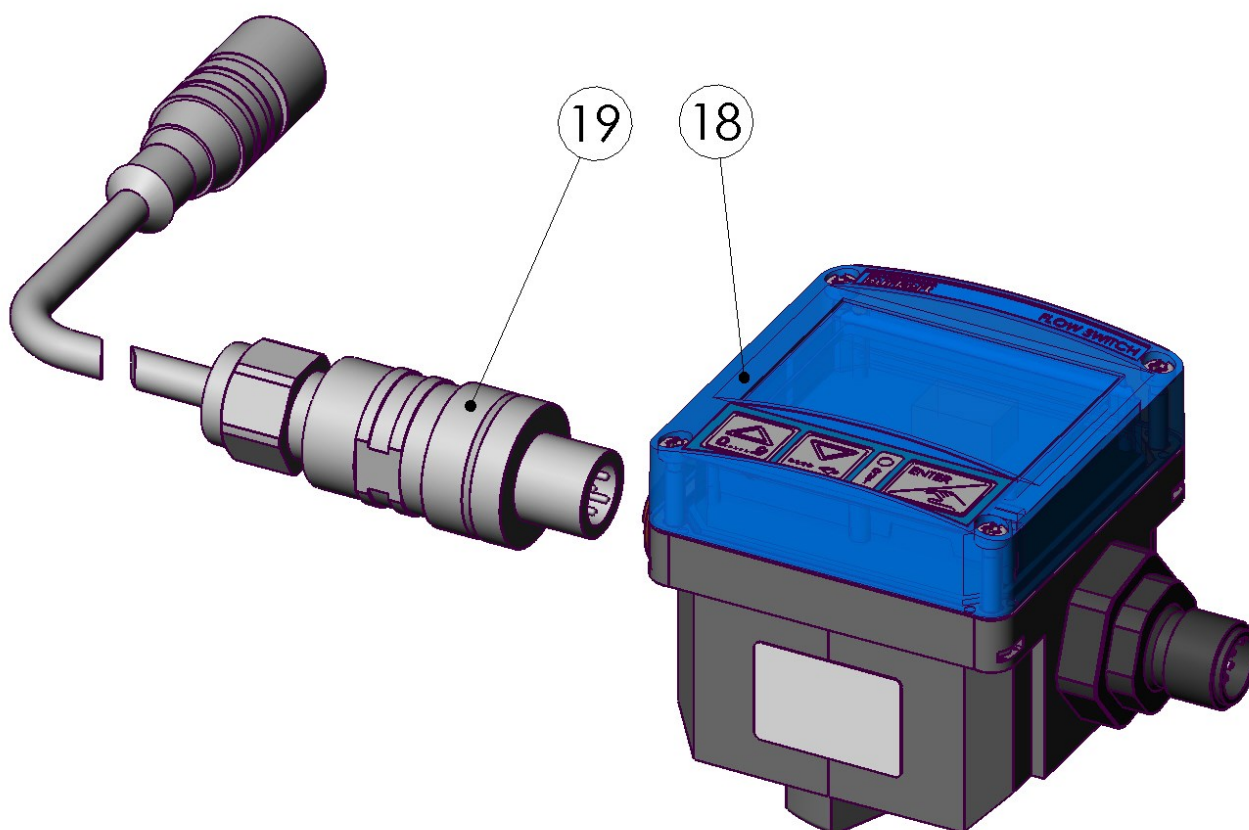
Component overview for pneumatic unit



- 13 Sealing head DN12 straight to robot base
- 14 Lockable air shut-off valve with quick pressure relief
- 15 Compressed air filter
- 16 Air pressure switch with M12 electrical connector
- 17 Air manifold

Master Jet

Component overview process control unit



- 18 Process control unit with display
- 19 Connecting cable from process control to cooling water unit

Contents

1	OPERATING INSTRUCTIONS	7
1.1	Symbols	7
2	AUTHORIZED USE	8
2.1	Restrictions	8
2.2	Predictable misuse	8
3	BASIC SAFETY INSTRUCTIONS	9
4	GENERAL INFORMATION	10
4.1	Scope of supply	10
4.2	Contact address	10
4.3	Warranty	10
5	PRODUCT DESCRIPTION	11
5.1	Intended use	11
5.2	Overview of the system	11
5.3	System description	11
6	TECHNICAL DATA	13
6.1	Conformity	13
6.2	Standards	13
6.3	Operating conditions	13
6.4	General technical data	13
6.4.1	Dimensions	14
6.4.2	Pneumatic unit	15
6.4.3	Coolant unit	15
6.4.4	Electrical data	15
6.4.5	Noise emission	16
6.5	Pneumatic-hydraulic circuit diagram	18
6.6	Electric circuit diagram	19
7	ASSEMBLY	20
7.1	Safety instructions	20
7.2	Assembling the Master Jet	20
8	INSTALLATION	22
8.1	Safety instructions	22
8.2	Pneumatic installation	22
8.3	Hydraulic installation	23
8.4	Electrical installation	24
9	START-UP	26
9.1	Safety instructions	26

9.2	Starting up the pneumatic unit	26
9.3	Starting up the coolant unit	27
10	OPERATION	28
10.1	Safety instructions	28
10.2	Automatic operation of the Master Jet	28
10.3	Programming the process control unit	29
	10.3.1 Operating elements	29
	10.3.2 Operating levels and operating states	29
	10.3.3 Changing between operating level and operating state	30
	10.3.4 Functions of the process operating level	31
	10.3.5 Functions of the configuration level	32
11	MAINTENANCE, TROUBLESHOOTING	33
11.1	Safety instructions	33
11.2	Maintenance work	33
11.3	Cleaning	34
11.4	Malfunctions	34
12	ACCESSORIES, WEARING PARTS	36
12.1	Accessories	36
12.2	Wearing parts	36
13	REPAIRS	37
13.1	Replacing process valve type 2000	37
13.2	Replacing the water expansion cylinder	38
13.3	Replacing the impeller sensor	39
14	DECOMMISSIONING	40
14.1	Safety instructions	40
14.2	Removing the Master Jet	40
15	TRANSPORTATION, STORAGE AND DISPOSAL	41

1 Operating instructions

The operating instructions describe the entire life cycle of the device. Keep these instructions in a location which is easily accessible to every user and make these instructions available to every new owner of the device.

WARNING!

The operating instructions contain important safety information!

Failure to observe these instructions may result in hazardous situations.
The operating instructions must be read and understood.

1.1 Symbols

DANGER!

Warns of an immediate danger!

Failure to observe the warning will result in a fatal or serious injury!

WARNING!

Warns of a potentially hazardous situation!

Failure to observe the warning may result in serious injuries or death!

CAUTION!


Warns of a potential danger!

Failure to observe this warning may result in a moderate or minor injury.

NOTE!

Warns of damage!

Failure to observe the warning may result in damage to the device or other equipment.

 *Important additional information, hints and recommendations.
Refers to information in these operating instructions or in other documentation.*

→ Designates a section which you must carry out.

2 Authorized use



WARNING!

General hazard information

Non-authorized use of the Master Jet may be dangerous to people, nearby equipment and the environment.

- The Master Jet is designed to control and monitor cooling circuits in industrial production plants.
- The Master Jet must not be used in potentially explosion-risk areas.
- Use according to the authorized data, operating conditions, and conditions of use specified in the contract documents and operating instructions. These are described in the chapter entitled "Technical Data".
- The Master Jet may be used only in conjunction with third-party devices and components recommended and authorized by Bürkert.
- Correct transportation, storage and installation as well as careful operation and maintenance are essential for reliable and fault-free operation.
- Do not make any external modifications to the device housings. Do not paint the housing parts or screws!
- Use the Master Jet only as intended.

2.1 Restrictions

If exporting the system, observe any existing restrictions.

2.2 Predictable misuse

- Supply the media connections of the system only with those media which are specified as flow media in the chapter entitled "Technical Data".
- Do not open the valve-actuator housing. If opened, there is a risk of injury from the tensioned spring inside.

3 Basic safety instructions

These safety instructions do not make allowance for any

- contingencies and events which may arise during the assembly, operation and maintenance of the Master Jet.
- local safety regulations – the operator is responsible for observing these regulations, also in relation to the assembly personnel.

DANGER!

Danger – high pressure!

- Before loosening hoses and valves, turn off the pressure and vent the hoses!

Risk of electric shock!

- Before reaching into the device or the equipment, switch off the power supply and secure to prevent reactivation!
- Observe the applicable accident prevention and safety regulations for electrical equipment!

General hazardous situations.

To prevent injuries:

- Do not feed any aggressive or flammable media into the system's media connections.
- Do not introduce any liquids into the compressed air connections.
- The step protection on the upper side of the device must not be loaded with more than 70 kg.
- Make sure the system cannot be activated unintentionally.
- Installation and repair work may be carried out by authorized technicians only and with the appropriate tools
- The process must restart in a defined or controlled manner after an interruption in the power supply or pneumatic supply
- The device may be operated only when in perfect condition and in consideration of the operating instructions.
- The general rules of technology apply to application planning and operation of the device.

NOTE!

Electrostatic sensitive components / modules

The device contains electronic components which react sensitively to electrostatic discharge (ESD). Contact with electrostatically charged persons or objects are hazardous to these components. In the worst case scenario, they will be destroyed immediately or will fail after start-up.

Observe the requirements in accordance with EN 61340-5-1 to avoid the possibility of damage caused by a sudden electrostatic discharge. Also, ensure that you do not touch electronic components when the power supply voltage is connected!



The device has been developed with due consideration given to the accepted safety rules and is state-of-the-art. Nevertheless, dangerous situations may occur. Failure to observe these instructions as well as any unauthorized tampering with the device release us from any liability and also invalidate the warranty covering the accessories!

4 General information

4.1 Scope of supply

- Basic device consisting of cooling water unit and pneumatic unit
- Process controller type 8611
- Connection cable 10m
- Master Jet operating instructions
- Brass screw joints for the cooling water unit, consisting of:
 - 1x sealing head union nut, DN12 straight
 - 2x sealing head union nut, DN12 60-90°
 - 1x sealing head union nut, DN20 straight
 - 2x bulkhead, DN12 straight
 - 1x bulkhead, DN20 straight
 - 1x bulkhead accord. to Ford standard, DN10 straight
- 1x universal sealing head steel galvanized DN12 straight for the pneumatic unit

4.2 Contact address

Bürkert Fluid Control Systems
Sales Center
Christian-Bürkert-Strasse 13-17
D-74653 Ingelfingen

Tel. + 49 (0) 7940 – 10 91 111
Fax + 49 (0) 7940 – 10 91 448
E-mail: info@de.buerkert.com
www.buerkert.com

4.3 Warranty

The warranty is only valid if the Master Jet is used as intended in accordance with the specified application conditions.



The warranty extends only to defects in the Master Jet and its components. We accept no liability for any kind of collateral damage which could occur due to failure or malfunction of the device.

5 Product description

5.1 Intended use

The Master Jet is designed to be used in industrial environments , in particular robot applications for resistance spot welding, and to control and monitor cooling water circuits.

5.2 Overview of the system

The Master Jet is used to control and monitor the coolant flow in industrial robot applications for resistance spot welding.

The coolant circuit is controlled by the unit and the required coolant quantity is regulated and monitored.

Additionally, the water pressure still within the system is reduced when the flow of cooling water is switched off.

This is advantageous when changing the welding electrodes, as cooling water spillage is avoided in doing so.

5.3 System description

The system consists of the following components:

- Pneumatic unit
- Coolant unit
- Process control unit

Pneumatic unit

- Lockable shut-off valve with quick pressure relief function
- Compressed air filter with aluminum housing, 5 µm micro filter, manual condensate drainage
- Pressure switch (NO) preset to 3.5 bar, M12 electrical connector
- DAir manifold housing with connection option G1/4" and G1/2"

The pneumatic unit is intended for the compressed air supply of the coolant unit. Furthermore, the air supply can be tapped for the robot and other applications.

Coolant unit

- Stainless steel coolant valve block
- Control valve unit with M12 electrical connector for connection of the process control, consisting of:
 - 2x pilot valve type 6144, NC, DN 0.6
 - 1x pilot valve type 6144, NO, DN 0.6
- Impeller flow sensor with optical flow recognition
- Control valve type 2000, NC, DN15, actuator size DM40, PPS
- Shut-off valve type 2000, NC, DN15, actuator size DM40, PPS
- Expansion cylinder DM63 for releasing residual pressure in the water return line

Regulation of the set coolant quantity occurs via the process valve in the supply line of the cooling circuit.

During shutdown, the pressure in the coolant circuit is reduced by the delayed valve control in the water return line.

Residual water pressure relief in the closed cooling circuit occurs via a pneumatically controlled relief cylinder.

Process control

- Flow rate type 8611
- M12 electrical connection cable

The coolant is monitored by an impeller flow sensor with optical recognition type 8012 and the process control type 8611.

The process control monitors the flow rate and signals its state via an output to a PLC or to the robot according to the programmed water flow monitoring window.

The flow sensor also features a flow direction detector.

The set-point value of the cooling water flow rate can be freely programmed in the process control .

6 Technical data

6.1 Conformity

The Master Jet corresponds to the specifications of the EC Declaration of Conformity with the Directives 2004/108/EC.

6.2 Standards

The applied standards which were used to demonstrate compliance with the EC Directives are listed in the EC Declaration of Conformity.

6.3 Operating conditions



WARNING!

Risk of injury!

Malfunction if used outside!

- Do not use the Master Jet outdoors and avoid heat sources which may cause the permitted temperature range to be exceeded.

During installation work, always ensure sufficient access for potential maintenance work.

Permitted temperatures

Ambient temperature: +5 °C to +55 °C / +41 °F to +131 °F

Media temperature: +5 °C to +90 °C / +41 °F to 194 °F

Media: Neutral liquid media and coolants

Degree of protection: IP65 in accordance with EN 60529

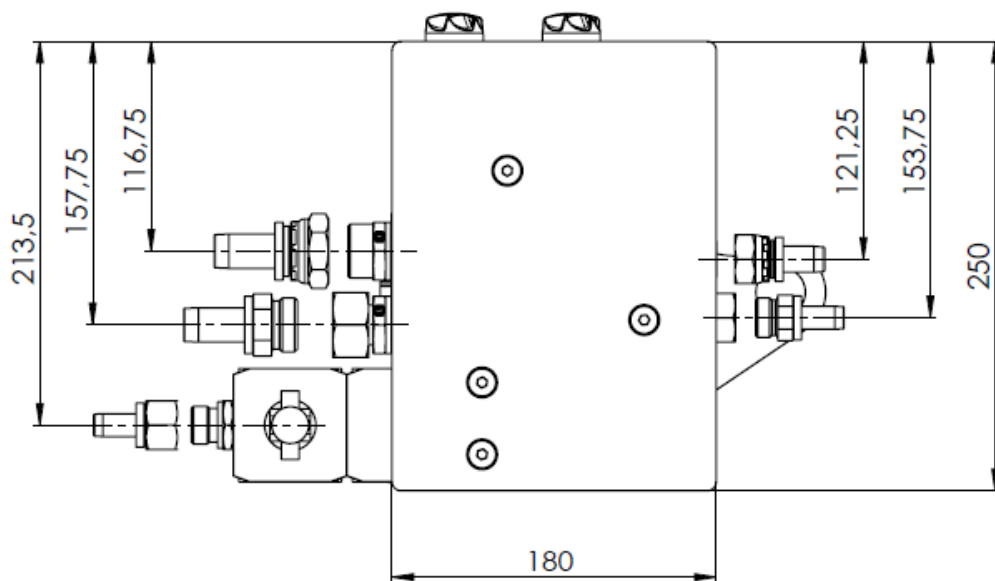
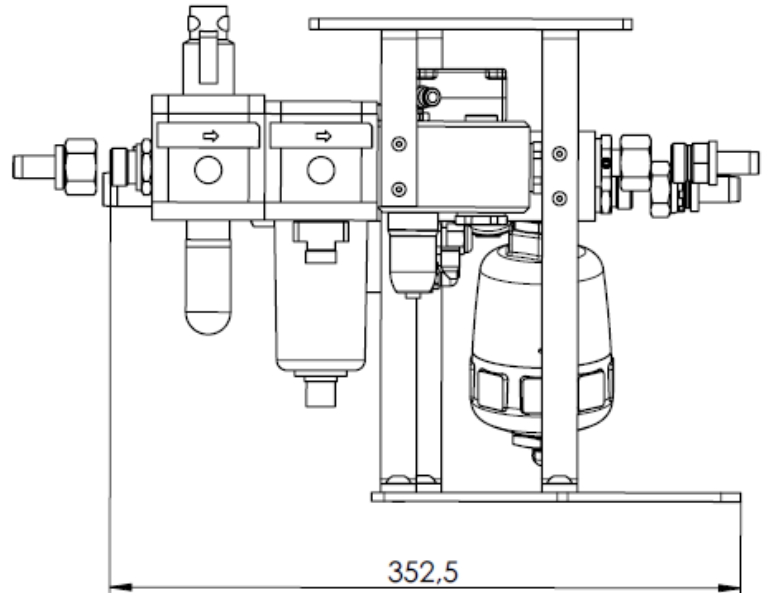
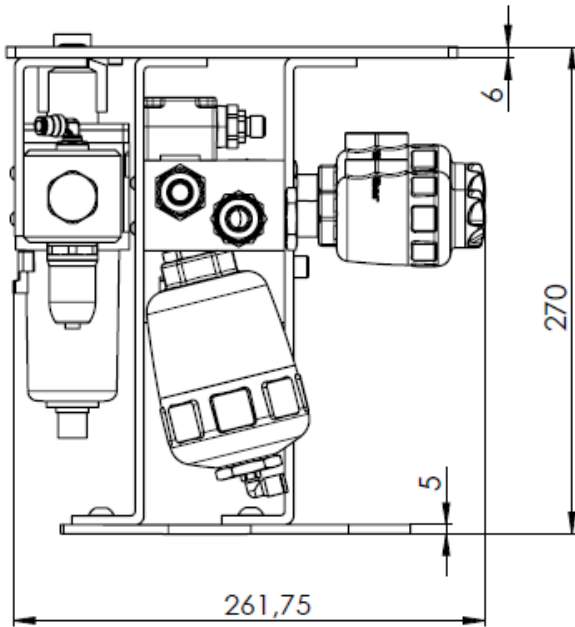
6.4 General technical data

Weight: 11 kg / 24.25 lbs

Housing material: Stainless steel / Aluminum

Sealing material: PTFE

6.4.1 Dimensions



6.4.2 Pneumatic unit

Control medium:	Quality classes in accordance with DIN ISO 8573-1
Dust content:	Class 5 (max. particle size 40 µm, max. particle density 10 mg/m ³)
Water content:	Class 3 (max. pressure dew point -20 °C or min. 10 °C below the lowest operating temperature)
Oil content:	Class 5 (max. 25 mg/m ³)
Temperature range of compressed air:	-10 °C to +50 °C / -23.3 °F to + 10 °F
Pressure range:	4 bar to 10 bar / 58 PSI to 145 PSI
Pressure switch: electrical socket	Normally open contact, preset at 3.5 bar / 50.7 PSI, M12 Switching capacity: max. 42 V, 4 A, 100 VA Pressure range: 1 to 10 bar / 14.5 PSI to 145 PSI
Connections:	Screw-in socket EO 24°, DN15 Plug-in hose connector Ø 6 mm x G1/4" (connection of the compressed air supply of the cooling water unit) Lock screw G1/2"

6.4.3 Coolant unit

Medium:	Water, cooling water
Max. operating pressure:	8.5 bar / 123.3 PSI (must be at least 0.5 bar / 7.25 PSI less than the pneumatic control pressure)
Ambient temperature:	+5 °C to +55 °C / +41 °F to 194 °F
Water connections on the block:	Screw-in socket EO 24°, DN15 and DN22, MS Straight screw-in socket with shaft EO 24° DN15 and DN22, MS

6.4.4 Electrical data

Process control type 8611:

Connection to PLC:	M12 electric device plug, 8-pole
Connection to control valve unit :	M12 electric device socket, 8-pole
Power supply:	24 V DC ± 10%
Energy consumption:	Approx. 2 W (without load)

Technical data

Total energy consumption: Max. 5 W (with load)

Pilot valve:

Power supply: 24 V DC

Power consumption: 0.8 W / pilot valve

Flow sensor type 8012:

Connection: M12 electric device plug, 5-pole

Power supply: Internal through control electronics

Measuring precision: $\pm 1\%$ of the final value

Measuring range: 0.3 m/s to 10 m/s

Output: 1 pulse/revolution
transistor output NPN, max. 700 mA

K factor: 112

6.4.5 Noise emission

The noise emitting level created by the Master Jet is less than 75 dB (A).
As a result, no further measures are needed.

The noise level may increase in combination with other devices in the direct vicinity. In such event, please take the measures listed in the table below.

$L_{EX,8h} \geq 80 \text{ dB(A)}$ or $L_{pC,peak} \geq 135 \text{ dB(C)}$

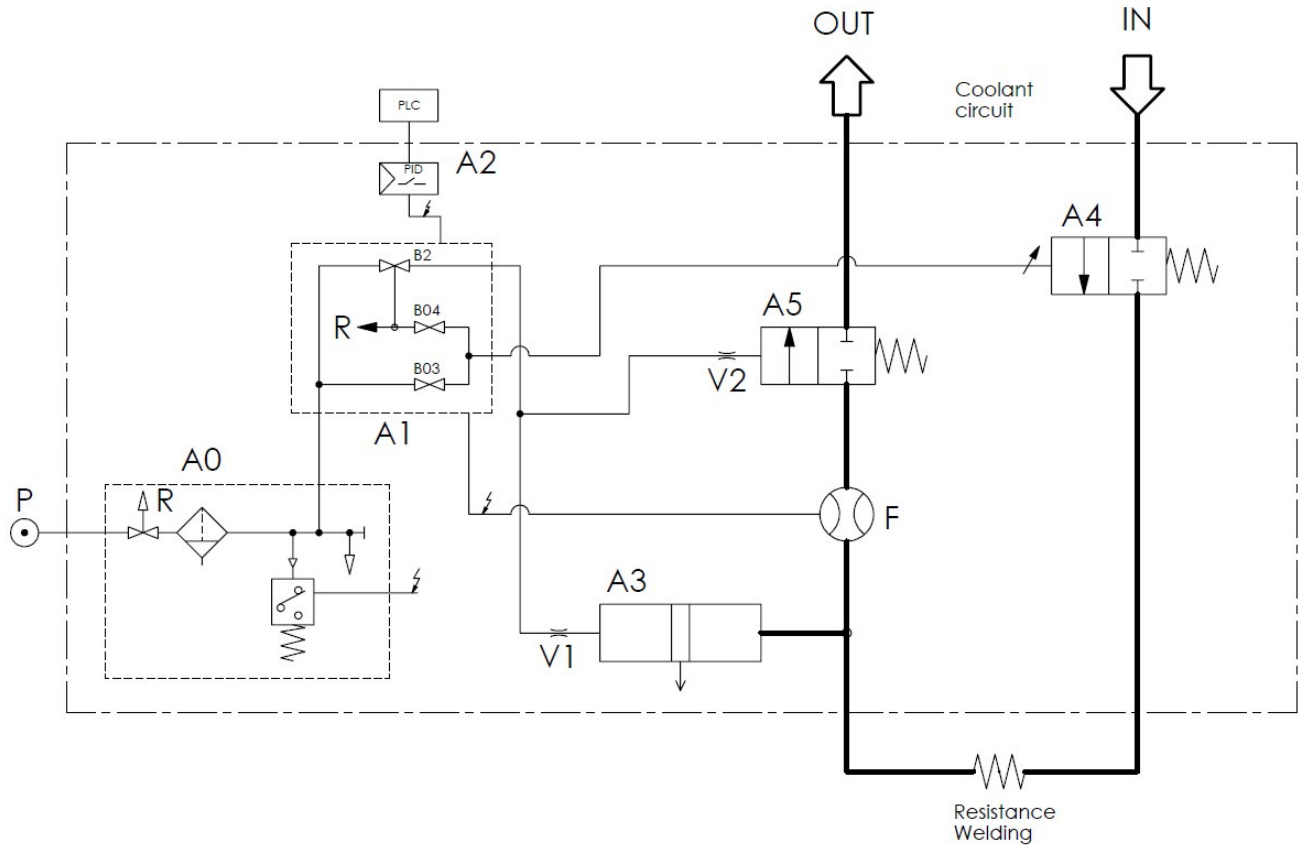
- Inform workers about the danger of noise
- Provide suitable ear protection
- Ensure general occupational health advice and guidance
- Offer preventive occupational health care (voluntary preventive health care provision)

$L_{EX,8h} \geq 85 \text{ dB(A)}$ or $L_{pC,peak} \geq 137 \text{ dB(C)}$

- Label noisy zones, safeguard and restrict access if technically possible
- Establish and initiate a noise reduction program
- Make sure workers wear ear protection
- Ensure correct use of ear protection
- Organize regular preventive care (mandatory preventive health care provision)

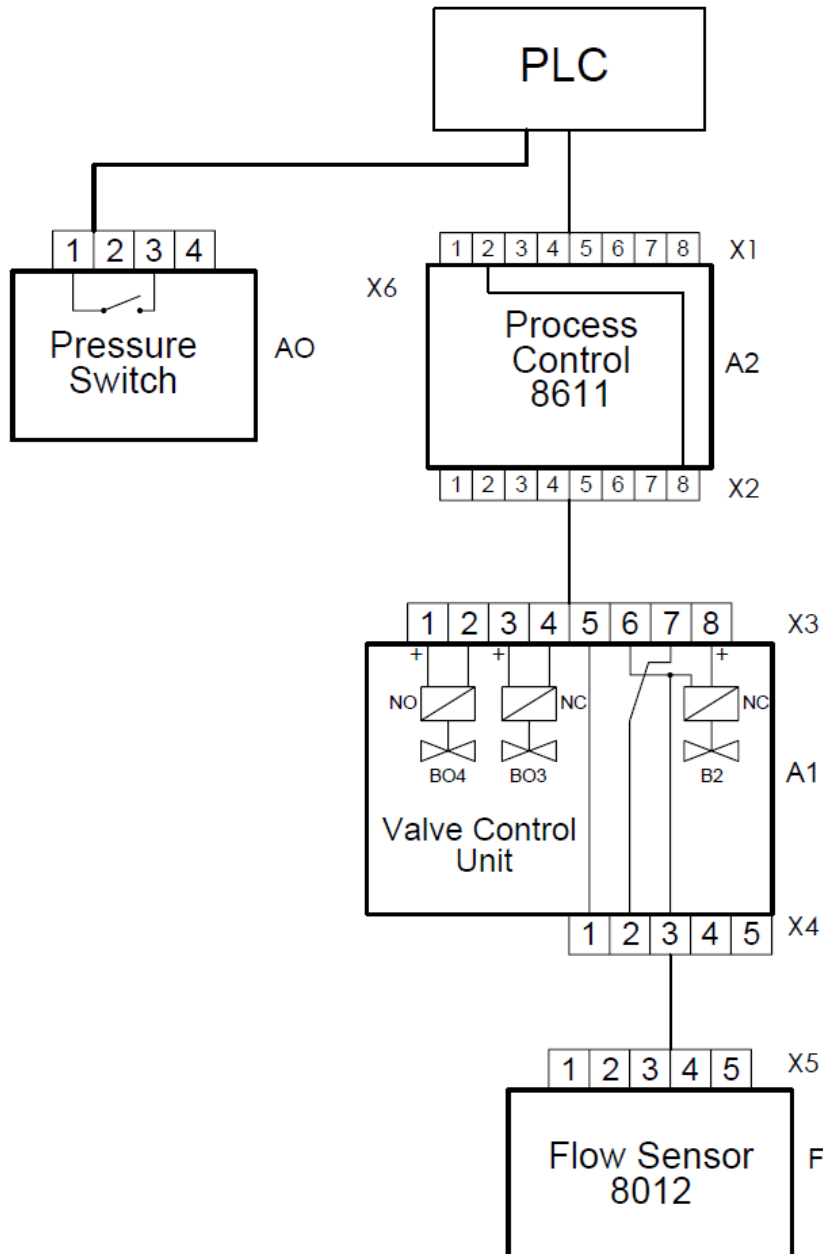
(Source: www.bg-laerm.de)

6.5 Pneumatic-hydraulic circuit diagram



- P Compressed air supply pneumatic unit
- A0 Pneumatic unit
- A1 Control valve unit
- A2 Process control
- A3 Expansion cylinder
- A4 Control valve in the supply line
- A5 Shut-off valve in the return line
- BO3 Air activation pilot valve supply line
- BO4 Air quick relief pilot valve supply line
- B2 Pilot valve return line
- F Impeller flow sensor
- R Air quick relief
- V1 Flow restrictor expansion cylinder control
- V2 Flow restrictor shut-off valve return line

6.6 Electric circuit diagram



X1: 8-pole M12 device plug

- 1 24 V DC
- 2 Input System Run
- 3 GND
- 4 -
- 5 -
- 6 -
- 7 -
- 8 Output Waterflow IO

X2: 8-pole M12 device socket

X3: 8-pole M12 device plug

- 1 BO4 +
- 2 BO4 -
- 3 BO3 +
- 4 BO3 -
- 5 24 V DC
- 6 B2 -
- 7 DIN1
- 8 B2 +

X4: 5-pole M12 cable connector

X5: 5-pole M12 device socket

- 1 24 V DC
- 2 NPN
- 3 GND
- 4 -
- 5 -

X6: 4-pole M12 device plug

- 1 NO1
- 2 -
- 3 NO2
- 4 -

7 Assembly

7.1 Safety instructions

DANGER!

Risk of injury due to high pressure in the system!

- Before loosening lines and valves, turn off the pressure and vent the lines!

Risk of injury due to electric shock!

- Before reaching into the device or the equipment, switch off the power supply and secure to prevent reactivation!
- Observe the applicable accident prevention and safety regulations for electrical equipment!

WARNING!

Risk of injury due to improper assembly!

- Assembly may only be carried out by authorized specialist personnel and using the appropriate tools.

Risk of injury due to unintentional activation of the system and uncontrolled restart!

- Secure system against unintentional activation.
- Following assembly, ensure a controlled restart!

7.2 Assembling the Master Jet

WARNING!

Risk of injury from sudden discharge of coolant due to improper installation!

If the installation position is incorrect (horizontal orientation or upside down), the unload function of the expansion cylinder is no longer ensured. As a result, coolant may be suddenly discharged when the electrode cap is changed on the spot welding gun.

- Install the function unit in an upright position only
- The installation position must be observed.
- **Assembly is correct when the step protection plate is on top!**

Procedure:

→ Screw the Master Jet onto the robot base using the designated bores in the base plate.

⚠ DANGER!

Risk of injury from falling robot!

When the Master Jet has been assembled, the robot must be screwed back into place to prevent it from becoming detached from the base frame and overturning.

- Before screwing in the fastening screws, it is essential to insert the appropriate conical spring washers.

Always tighten to specified torque rate specified by KUKA for the particular robot type!

In principle, different attachment options are permitted when assembling the Master Jet.

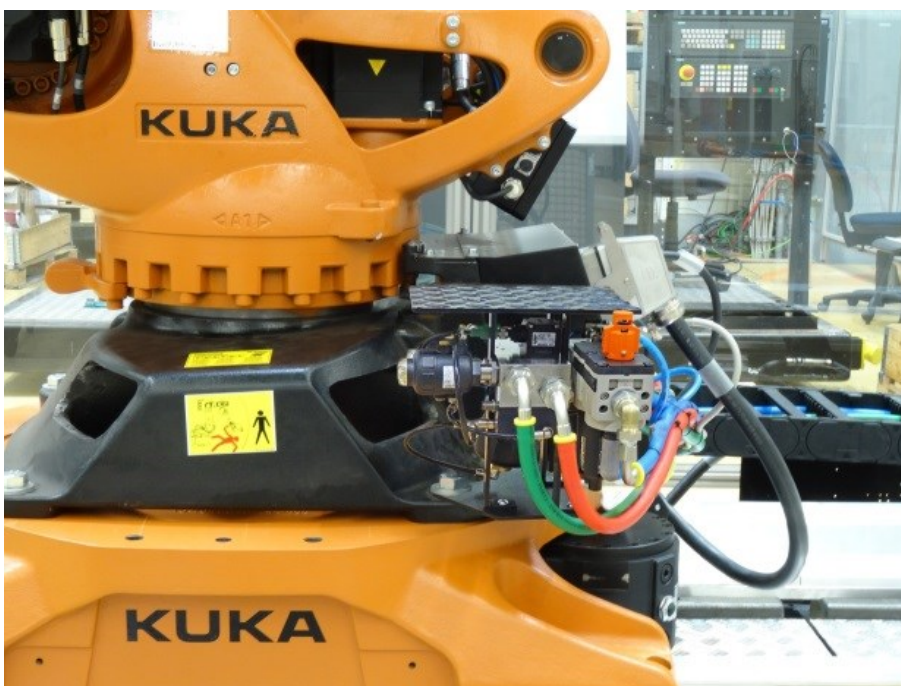
Recommendation:

The unit should be mounted as close as possible to the process (e.g. robot base).

Long hose lengths are required with large distances. This has the following effects:

- The amount of coolant inside the hoses increases with length, which means that a correspondingly larger expansion cylinder has to be selected.
- Delayed reaction times when it comes to changes in the flow rate caused, for example, by an electrode tip coming off on the spot-welding gun.

The detection of these and other fault conditions are therefore also delayed.



8 Installation

8.1 Safety instructions



DANGER!

Risk of injury due to high pressure in the system!

- Before loosening lines and valves, turn off the pressure and vent the lines!

Risk of injury due to electric shock!

- Before reaching into the device or the equipment, switch off electrical power supply and secure to prevent reactivation!
- Observe the applicable accident prevention and safety regulations for electrical equipment!



WARNING!

Risk of injury due to improper installation!

- Installation may only be carried out by authorized specialist personnel and using the appropriate tools.

Risk of injury due to unintentional activation of the system and uncontrolled restart!

- Secure system against unintentional activation.
- Following installation, ensure a controlled restart!

8.2 Pneumatic installation



DANGER!

Risk of injury due to high pressure in the system!

- Before loosening lines and valves, turn off air pressure and vent the lines!

→ Connect the factory compressed air supply to the pneumatic unit inlet of the Master Jet (hose DN12).

Note!

Damage caused by high inlet pressure!

- The input pressure available at the factory must not exceed the maximum permitted input pressure of the system.
- If the pressure is too high, a pressure reducer valve must be connected upstream.

8.3 Hydraulic installation

NOTE!

Damage caused by improper tightening of the screws!

- When tightening the universal rotary joint observe the maximum torque or the 1/4 revolution tightening rule, hence the screw connection can break and leak.

Procedure:

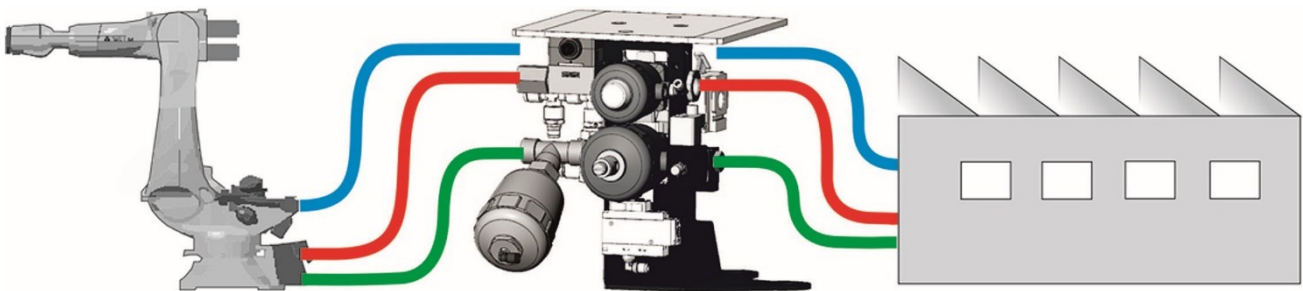
- On the input side of the Master Jet, connect the plant cooling water supply to the supply line and return line using the supplied sealing heads and bulkheads DN20.
- Cut the connection hoses to length depending on the distance to the Master Jet outlet and to the connection point of the robot base. Leave the hoses long enough so that they can be installed with sufficient bending radius. A too small bending radius can restrict water flow.
- Now connect the prepared hoses to the Master Jet on the output side and to the robot base using the supplied sealing heads and bulkheads DN12.

NOTE!

The Master Jet will malfunction if the supply line and return line are interchanged!

If the direction of flow is interchanged, an occurring water flow will not be measured.

- Note the direction of flow when connecting the cooling water supply.



Hose connection overview for Master Jet

Color-coded hose connections:

Supply line **green**
 Return line **red**
 Pneumatics **blue**

8.4 Electrical installation

DANGER!

Risk of injury due to electric shock!

- Before reaching into the device or the equipment, switch off electric power supply and secure to prevent reactivation!
- Observe the applicable accident prevention and safety regulations for electrical equipment!

Procedure:

- Connect the supply voltage for the process control unit (A2) to the 8-pole device plug (X1) (connection cable not included in the scope of supply).
- In the event of an alarm, etc., the unit's monitoring signal can be routed to the PLC or the robot via the corresponding cable ("*Waterflow IO*", pin 8 and "*System Run*", pin 2).
- Connect the control valve unit (A1) to the 8-pole cable plug (X2) via the supplied connection cable (K1).
- Connect the pressure switch of the pneumatic unit (X6) and connect it to the PLC (connection cable not included in the scope of supply).

Plug configuration X1

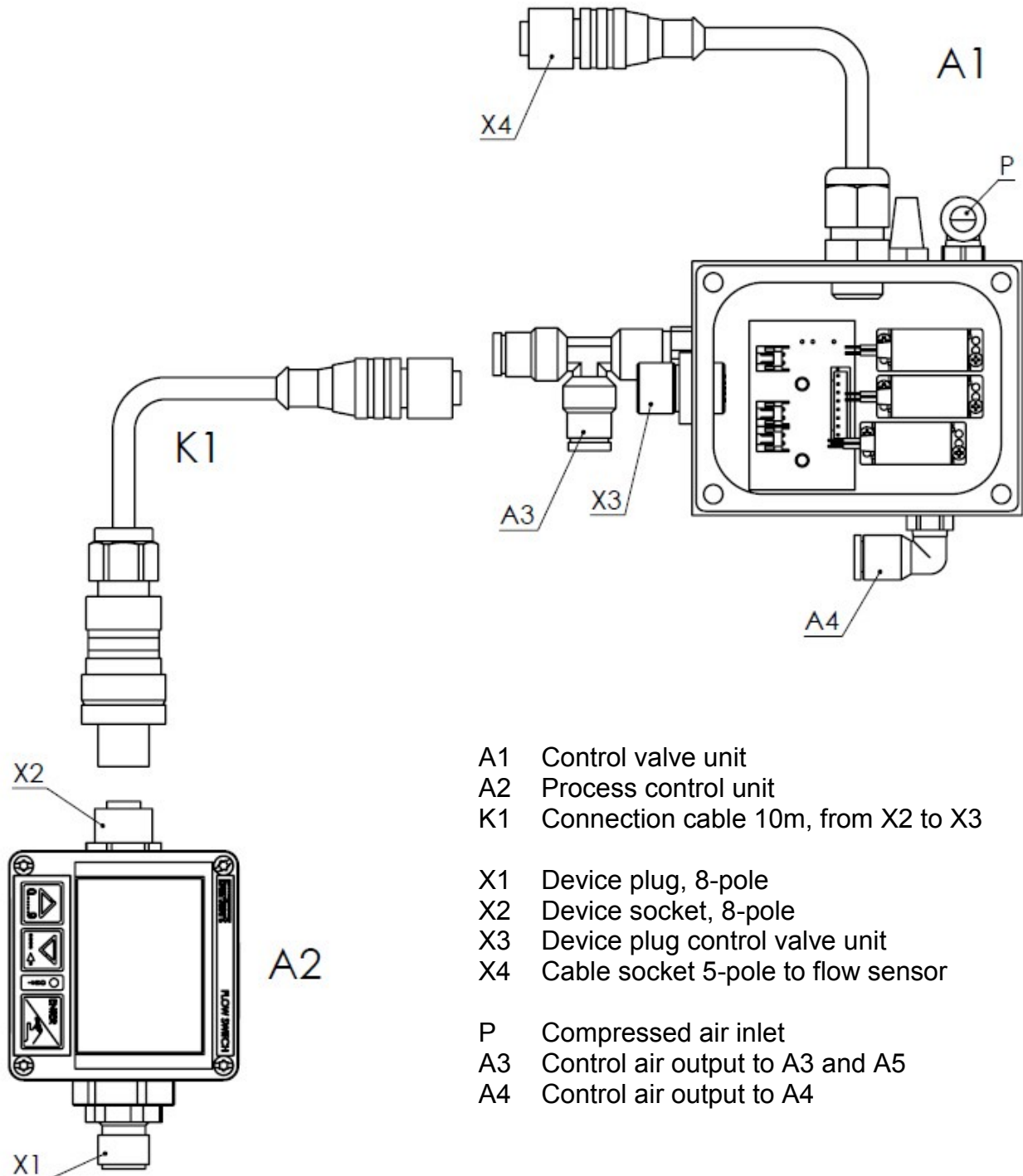
Pin	Configuration
1	V+ (24 V DC)
2	Input, <i>System Run</i> (24 V DC)
3	GND
4	NC
5	NC
6	NC
7	NC
8	Output, <i>Waterflow IO</i> (24 V DC)

NOTE!

Observe the maximum load capacity on the outputs!

- Failure to do so can overload the device and damage the electronics.

Overview: Connection diagram of process control unit to control-valve unit



- A1 Control valve unit
- A2 Process control unit
- K1 Connection cable 10m, from X2 to X3
- X1 Device plug, 8-pole
- X2 Device socket, 8-pole
- X3 Device plug control valve unit
- X4 Cable socket 5-pole to flow sensor
- P Compressed air inlet
- A3 Control air output to A3 and A5
- A4 Control air output to A4

9 Start-up

9.1 Safety instructions

WARNING!

Risk of injury due to improper operation!

Improper operation may result in injuries as well as damage to the device and its environment!

- Before start-up, ensure that the operating personnel are familiar with and completely understand the contents of the operating instructions.
- Observe the safety instructions and authorized use.
- Only adequately trained personnel may start up the equipment/the device.

9.2 Starting up the pneumatic unit

To test the Master Jet, the pneumatic unit must first be activated by opening the quick relief shut-off valve.

DANGER!

Risk of injury from moving compressed air hoses that are not connected!

- Check all of the hose connections are secured tightly before charging the pneumatic unit with compressed air.
- Ensure that the exhaust shut-off valve remains closed during initial start-up.

Procedure:

- Open the air supply line on the input side of the pneumatic unit.
- Check the compressed air connections and resolve any existing air leaks with suitable measures.
- Open the exhaust shut-off valve if there are no existing air leaks.
- Again, check the compressed air connections and components of the pneumatic unit for leaks.
- Ensure that there are no leaks.
- Now check the electrical feedback of the pressure switch.
- Check whether the input on the connected PLC or robot control is in logical switching state "1".
- When the quick pressure relief shut-off valve has been shut off, the input of the connected PLC should switch to logical switching state "0".

This completes start-up of the pneumatic unit.

9.3 Starting up the coolant unit

When the connected line system has been pressurized with compressed air, the coolant unit can be started up.

Procedure:

→ After activating cooling water flow from plant supply, check the line supply to the Master Jet on the input side for leaks.

NOTE!

Observe the maximum permitted medium pressure!

- The coolant pressure must be at least 0.5 bar / 7.25 PSI less than the pneumatic control pressure. Otherwise correct system functioning is not guaranteed.

- Repair any leaks in the hose connections of the cooling water circuit.
- Check the screw joints on the output side for leaks.
- Switch on the "System Run" signal (pin 2 at X1) to check correct electrical functioning. The coolant circuit is subsequently opened.
- If the current water flow rate is within the set limit values, it is indicated by a red LED. The output signal at X1, pin 8, is active ("*Waterflow IO*").
- If all conditions are correct, the current flow rate and the set-point value is displayed on the display of the process control unit.
- Factory pre-settings, refer to chapter 10.3.5.
- If other settings are desired, they can be changed in manual mode. To return to factory settings, use the "Fact" menu option.
- Now reset the "System Run" signal to logical "0" on the controlling device (PLC or robot control)
- The cooling circuit is closed and the air chamber in the expansion cylinder is deaerated after a delay. The water pressure left in the cooling circuit for the spot welding gun is relieved into the expansion cylinder.

After testing the function of the expansion cylinder, start-up is complete.

10 Operation

10.1 Safety instructions

WARNING!

Risk of injury from improper operation!

Improper operation may result in injuries as well as damage to the device and its environment!

- The operating personnel must know and have understood the contents of the operating instructions.
- Observe the safety instructions and authorized use.
- Only adequately trained personnel may operate the equipment/the device.

10.2 Automatic operation of the Master Jet

In order to activate the cooling circuit, the "System Run" signal is switched via a PLC or a robot control which pneumatically activates the valves in the supply line and return line of the cooling circuit – the cooling circuit is in operation.

Parallel to activation of the cooling circuit, the expansion cylinder is activated pneumatically with a certain delay. When activated, the expansion cylinder installed in the return line of the cooling circuit presses the cooling water in the cylinder into the cooling circuit.

If the cooling circuit is closed via the control (the "System Run" signal is switched off), activation of the expansion cylinder is also switched off with a certain delay. The existing water pressure is dispelled in the expansion cylinder.



The dimensions of the expansion cylinder are dependent on the length and diameter of the cooling circuit hoses. In the standard design, the Master Jet is used on the robot base.

When the cooling circuit is activated, cooling water passes through the flow sensor installed in the return line.

The flow sensor sends electric pulses to the process control unit corresponding to the actual flow rate.

The process control unit calculates the flow rate based on the incoming pulses and compares them with the minimum and maximum values which were specified by the user.

10.3 Programming the process control unit

The process control unit has factory preset control parameters, K factor for the flow sensor, and limit values of the permitted flow rate.

10.3.1 Operating elements

Enter key



- Switches between the operating states AUTOMATIC and MANUAL
- Switches between operating and configuration level
- Selection of menu option
- Take over settings

Arrow keys



- Change the display at the process operating level in AUTOMATIC operating state
- Change the menu options in MANUAL operating mode and at the configuration level
- Entering of numerical values

Left

Right

10.3.2 Operating levels and operating states

There are two levels and two operating states for operating and setting the process control unit: AUTOMATIC and MANUAL.

Level 1:

Process operating level

At level 1, the user can switch between the operating states AUTOMATIC and MANUAL.

Operating state:

AUTOMATIC

The normal controlled operation is executed and monitored.

MANUAL

Quick access to important functions and test functions. The operating state MANUAL is indicated on the display by a hand symbol.

Level 2: Configuration level

At level 2, the user can change the basic settings of the control unit. Access is code protected.

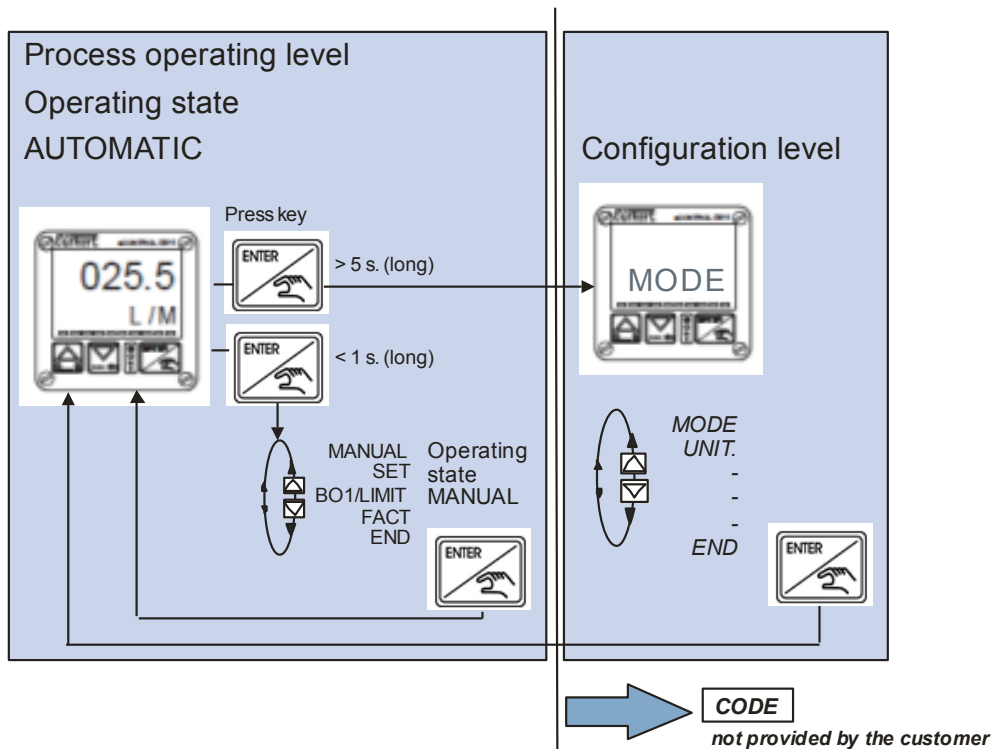
After switching on the operating supply voltage, the control unit is at the process operating level and in the AUTOMATIC operating state.

When the operating supply voltage is applied, the software version will light up on the display for approx. 2 seconds.

10.3.3 Changing between operating level and operating state

The ENTER key is pressed to change the operating level and operating state.

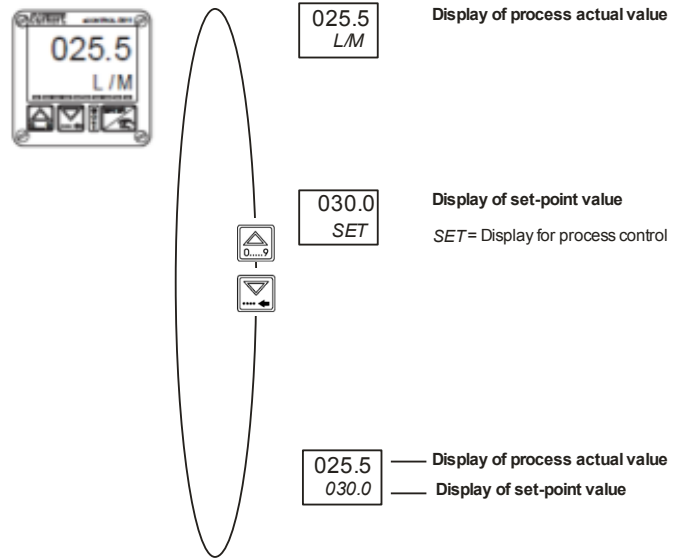
! Any changes made within the configuration level are only stored after returning to the process operating level.
 Changes in the Manual operating state can be made while the controller is running.



10.3.4 Functions of the process operating level

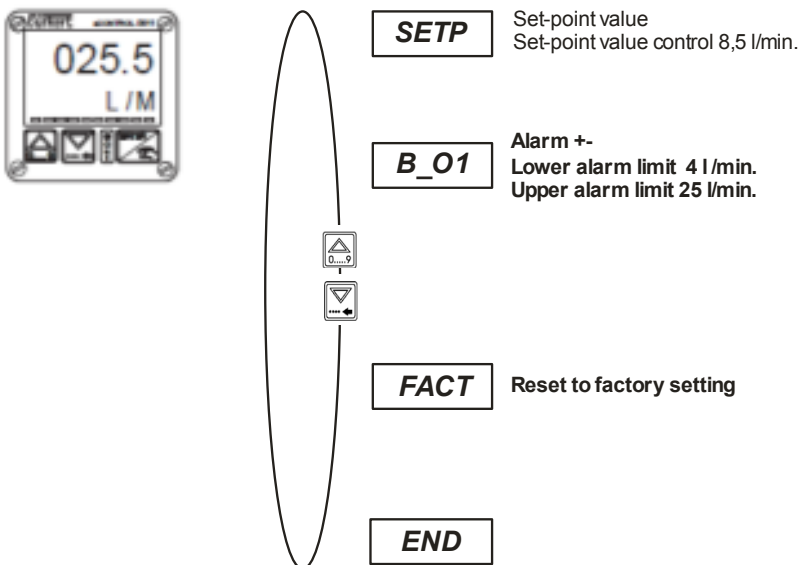
Operating state AUTOMATIC:

Press the arrow keys to switch between 2 different displays for monitoring the controlled operation.



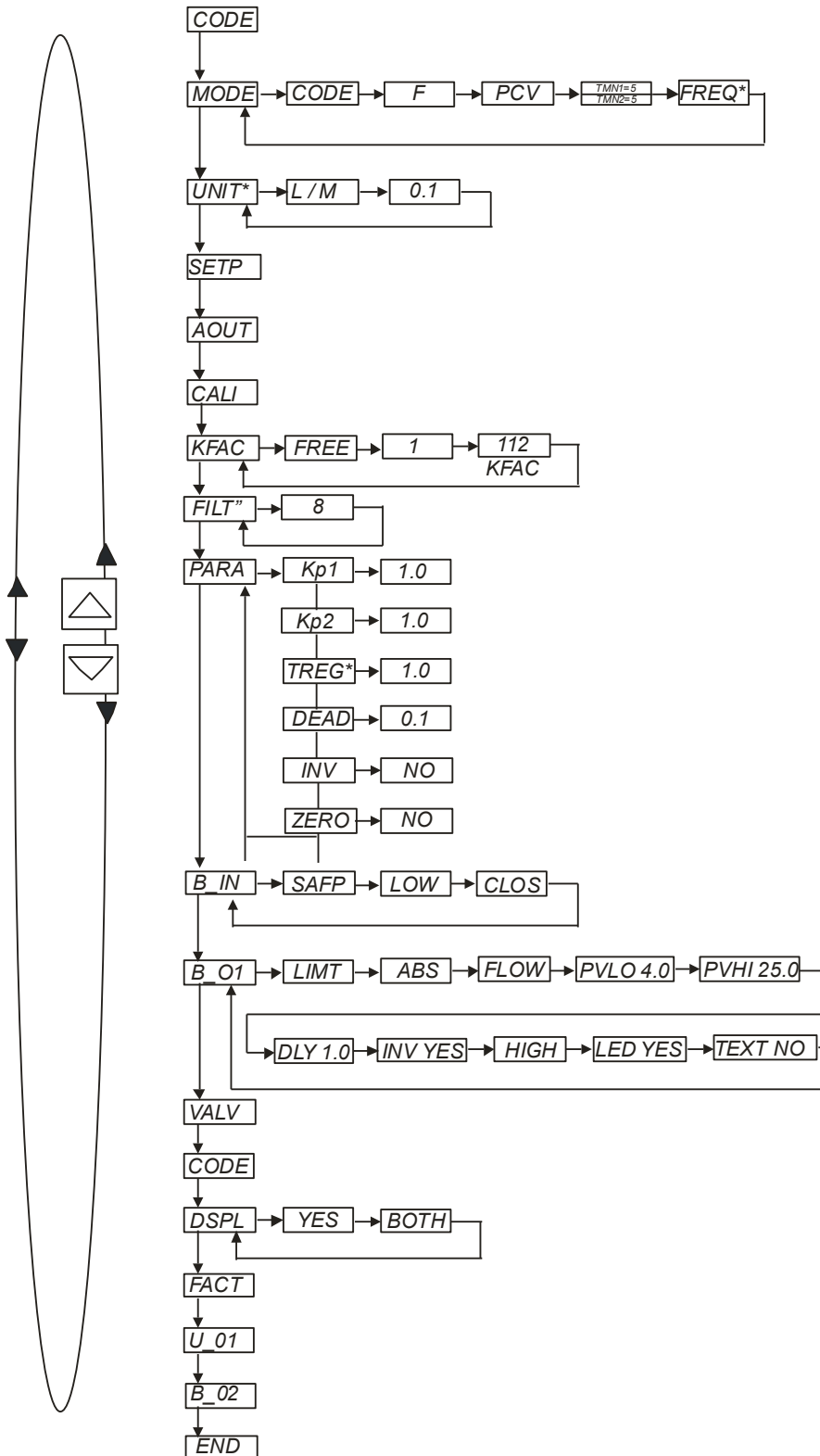
Operating state MANUAL:

Briefly press (< 1 s) the ENTER key to go to the MANUAL operating state. The operating state is indicated on the display by a hand symbol



10.3.5 Functions of the configuration level

The functions of the configuration level are password protected and should only be changed by *Bürkert*-trained operating personnel.



11 Maintenance, troubleshooting

11.1 Safety instructions

DANGER!

Risk of injury due to high pressure in the system!

- Before loosening lines and valves, turn off the pressure and vent the lines!

Risk of injury due to electric shock!

- Before reaching into the device or the equipment, switch off electric power supply and secure to prevent reactivation!
- Observe the applicable accident prevention and safety regulations for electrical equipment!

WARNING!

Risk of injury due to improper maintenance work!

- Maintenance may only be carried out by authorized specialist personnel and using the appropriate tools.

Risk of injury due to unintentional activation of the system and uncontrolled restart!

- Secure system against unintentional activation.
- Following maintenance, ensure a controlled restart.

11.2 Maintenance work

The actuators of the Master Jet are maintenance-free, provided they are used according to these operating instructions.

Parts which are subject to natural wear:

- Seat seal of the shut-off valves
 - Seals
 - Filter element of the compressed air filter
- must be regularly maintained.

If leaks occur, replace the particular worn part with an appropriate spare part.

11.3 Cleaning

Do not use alkaline cleaning agents to clean the surface of the device type 8821.

11.4 Malfunctions

If malfunctions occurs, the following checks are recommended:

- Line connections
- Electric power supply and corresponding I/O signals
- Is the operating pressure within the permitted range?

Malfunction	Possible cause	Remedial action
No values displayed at the process controller	No electric power supply	→ Check the electrical connections
No flow rate available	No connection from the process control unit to the control valve unit	→ Use the connection cable (10m) to connect the process control unit to the control valve unit
	No connection from the control valve unit to the flow sensor	→ Check the connection cable
	Impeller sensor defective	→ Replace the impeller sensor (chapter 13.3)
	"System Run" signal not activated	→ Check signal level from the PLC
	Coolant unit not ready for operation	→ Check the pneumatic input pressure and, if necessary, replace the compressed air filter element → Check the media pressure

Malfunction	Possible cause	Remedial action
Preset flow rate is not adjusted	Medium inlet pressure too low	→ Check the media pressure
	Process valves do not open fully (check the yellow position indicator at the valve)	→ Check the pneumatic control pressure
	Hydraulic hoses from and to the Master Jet blocked	→ Check hydraulic hoses and, if necessary, eliminate blocking point
	Set-point value of the flow-rate set too high	→ Reduce the set-point value
	K factor at the process controller set incorrectly	→ Check the factory settings at the process control unit and, if necessary, return to the manufacturer
Increased water spillage when replacing weld electrode tips	Water expansion cylinder does not open	→ Pneumatic control pressure too low
	Water expansion cylinder is not purged from air when switching off	→ Check the pressure at the pneumatic control line of the water expansion cylinder
	Hydraulic hoses from and to the Master Jet are too long, resulting in an increased volume of water	→ Install additional extendable expansion cylinder
	Water expansion cylinder defective	→ Replace the water expansion cylinder (chapter 13.2)
	Process valves do not close fully or fast enough	→ Check the process valves in the supply and return line and, if necessary, replace them (chapter 13.1) → Check the coolant unit on the media side for contamination and debris

12 Accessories, wearing parts

WARNING!

Risk of injury when opening the actuator housings!

The actuators contain tensioned springs. When the housing is opened, injuries may be caused by the springs jumping out!

- Do not open the actuator housing!

CAUTION!

Risk of injury and/or damage due to use of incorrect parts!

- Incorrect accessories and unsuitable spare parts may cause injuries and damage the device and its environment.
- Use original accessories and original spare parts from Bürkert only!

12.1 Accessories

Accessories	Order number
Connection cable process control unit, 8-pole, 20 m	773572
Connection cable process control unit, 8-pole, 30 m	773573
Stackable expansion cylinder	289692

12.2 Wearing parts

Wearing parts	Order number
Impeller flow sensor	564079
Process control unit type 8611	566904
Connection cable process control unit, 8-pole, 10 m	772990
Water expansion cylinder	252921
Control valve DN15, supply line	294159
Shut-off valve DN15, return line	301308
Pneumatic unit complete	583822
Replacement filter element 5 µm for compressed air filter	On request

13 REPAIRS

13.1 Replacing process valve type 2000

DANGER!

Risk of injury due to high pressure in the system!

- Before loosening lines and valves, turn off the pressure and vent the lines!

NOTE!

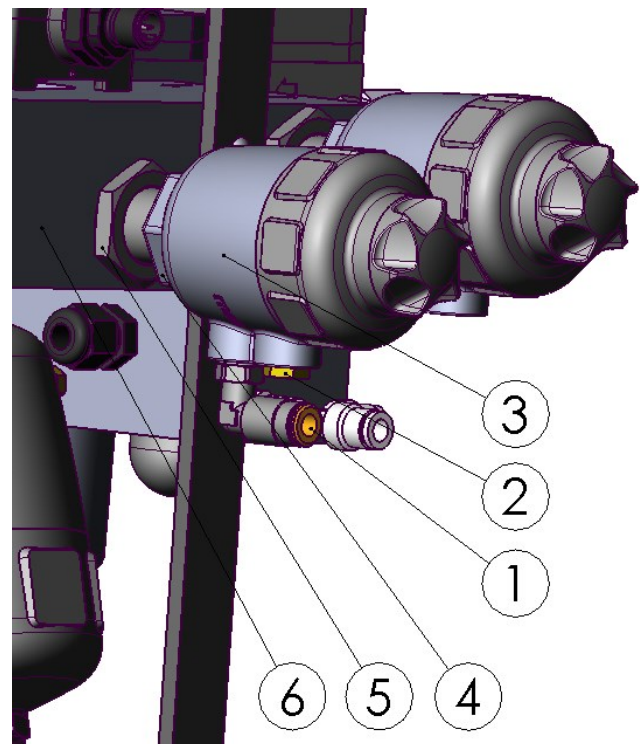
Malfunction caused by interchanging the hose connections

- Before detaching the plug-in hoses, mark the associated hoses and connectors to prevent interchanging the connections during re-assembly.

- Remove pneumatic hose from the hose connection (1).
- Disassemble the silencer (2) and the hose connection.
- Unscrew the valve (3) using a flat wrench (size 30) at the brass nipple (5).
- Remove the old graphite seal from the valve block and clean the sealing point.
- Insert new seal into the valve block (6).
- Screw in the new valve actuator:
Torque: (45 ± 3) Nm

The correct position of the pilot air ports can be aligned continuously by rotating the actuator.

- Move the actuator to the desired position using a flat wrench (size 30) to clockwise rotate the hexagon surface of the housing (4).
- Screw the hose connection into the lower pilot air port:
Torque: 6 Nm
- Screw the silencer into the upper pilot air port:
Torque: 2 Nm
- Insert the pneumatic hose into the hose connection.
- Check the Master Jet for function and leaks.

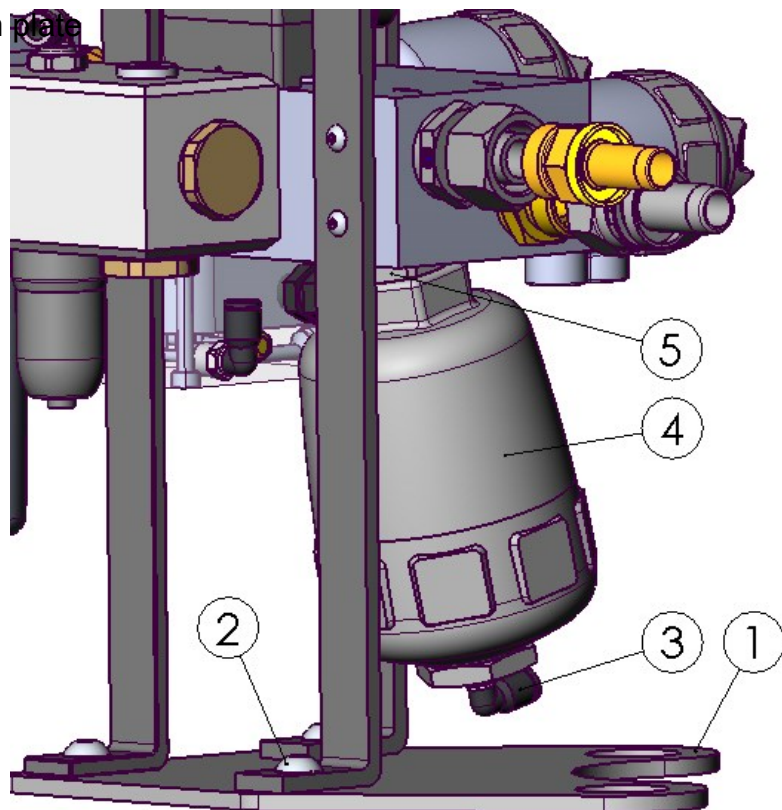


13.2 Replacing the water expansion cylinder

DANGER!

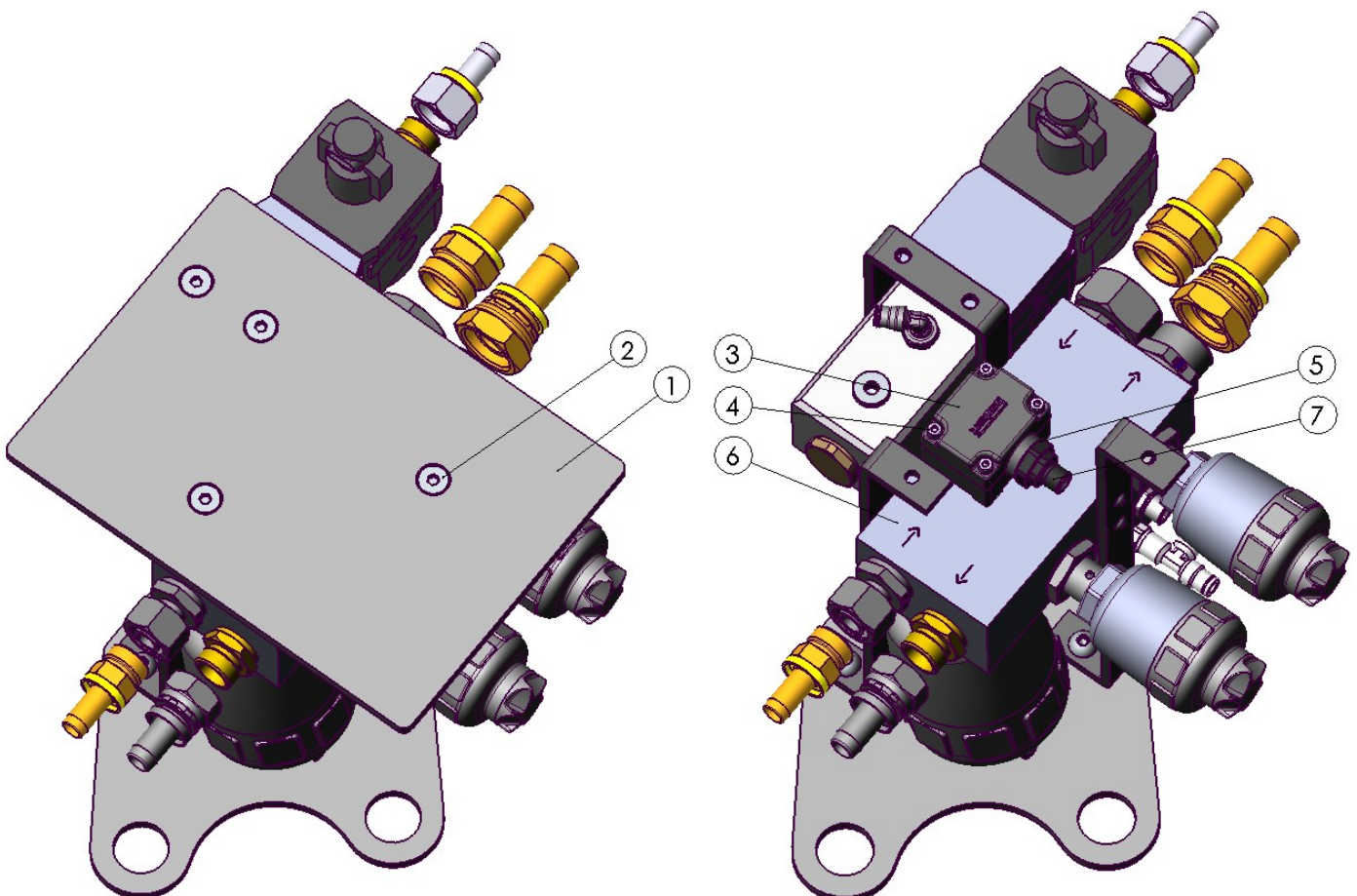
Risk of injury due to high pressure in the system!

- Before loosening lines and valves, turn off the pressure and vent the lines!
- Loosen the three hexagonal socket-fillister head screws (2) to unscrew the flanged connection plate (1) at the Master Jet.
- Remove the pneumatic hose from the hose connection (3).
- Unscrew the hose connection with integrated flow restrictor from the water expansion cylinder (4).
- Use a flat wrench (size 36) to unscrew the water expansion cylinder from the threaded adapter (5). Use a flat wrench (size 32) to counter hold it.
- Screw a new water expansion cylinder into the adapter. Make sure the O-ring at the threaded adapter is not damaged. Otherwise it must be replaced.
- Screw the hose connection with flow restrictor into the water expansion cylinder:
Torque: 6 Nm
- Push the plug-in hose for the pneumatic control back into the hose connection.
- Screw the flanged connection plate back onto the base frame:
Torque: 24 Nm
- Check the Master Jet for function and leaks.



13.3 Replacing the impeller sensor

- Remove the step protection plate (1) by loosening the 4 hexagonal socket head screws (2).
- Unscrew the sensor connection cable at the impeller sensor (3).
- Unscrew the impeller sensor from the coolant unit (6) by loosening the 4 hexagonal socket head screws M4x35 (4).
- Position the supplied green O-ring (5) on the new impeller sensor.
- Place the new impeller sensor on the connection hole of the coolant unit and fix it into position using the hexagonal socket head screws M4x35:
Torque: (1.5 + 0.5) Nm
- Screw the sensor connection cable onto the device plug of the sensor (7).
- Position the step protection plate on the unit and screw it into place:
Torque: 24 Nm
- Check the Master Jet for proper function.



14 DECOMMISSIONING

14.1 Safety instructions

DANGER!

Risk of injury due to high pressure in the system!

- Before loosening lines and valves, turn off the pressure and vent the lines!

Risk of injury due to electric shock!

- Before reaching into the device or the equipment, switch off electric power supply and secure to prevent reactivation!
- Observe the applicable accident prevention and safety regulations for electrical equipment!

WARNING!

Risk of injury due to improper removal!

- Removal may only be carried out by authorized specialist personnel and using the appropriate tools.

14.2 Removing the Master Jet

DANGER!

Risk of injury from falling robot!

When the Master Jet has been removed, the robot must be screwed back into place to prevent it from becoming detached from the base frame and overturning.

- Before screwing in the fastening screws, it is essential to insert the appropriate conical spring washers.
- Tighten the robot base screws to the specified torque rate found in the KUKA product specification

15 Transportation, storage and disposal

NOTE!

Transport damage!

Inadequately protected devices may be damaged during transportation.

- Protect the device against moisture and dirt in shock-resistant packaging during transportation.
- Prevent the temperature from exceeding or dropping below the permitted storage temperature.
- Protect the electrical interface of the solenoid coil and the pneumatic connections from damage by placing protective caps on them.

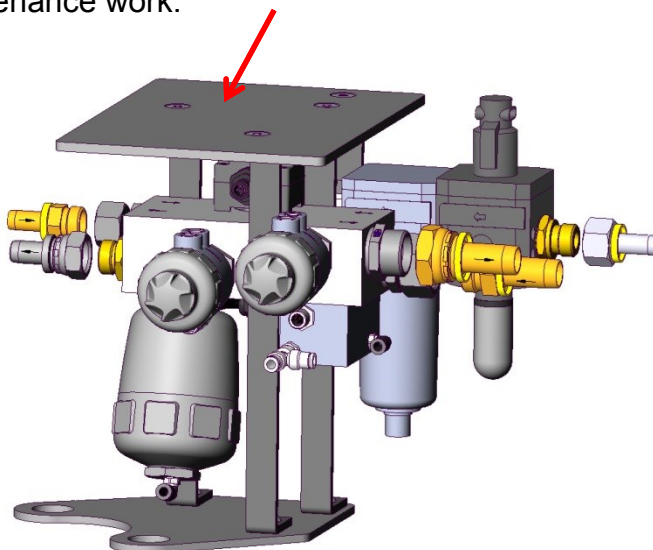
Incorrect storage may damage the device!

- Store the device in a dry and dust-free location
- Storage temperatures -10 °C to +55 °C / 15 °F to 131 °F

Damage to the environment caused by device components contaminated with media!

- Dispose of the device and packaging in an environmentally friendly manner!
- Observe applicable disposal and environmental regulations

The Master Jet should only be transported in the intended packaging. Always use the step protection plate to raise the system when transporting it in-house to the place of installation or for maintenance work.



NOTE!

Lifting up the Master Jet other than by grabbing it at the step protection plate may result in damage to the Master Jet.

