Original Instructions: German
Translation of Original Instructions

Weld Head Series

F120 and F160

OPERATING INSTRUCTIONS

76609408EN-F120-F160-V1.6c

Annex:
- Safety Regulations
- General References on Resistance welding
- Contact addresses

Versions		
Version	**Date**	**Basis of Version**
1.0	2001-11	new
1.1	2003-04	addendum with safety hints
1.2	2004-01	addendum automation
1.2a	2004-11	addendum F160-DZ
1.2c	2006-04	Miyachi-version, declaration by the manufacturer
1.2d	2007-04	Declaration by the manufacturer personal change
1.3a	2007-07	New declaration;
1.4b	2009-08	Safety extra, Corrections
1.5	2010-05	Declaration of Incorporation
1.50a	2015-07	Changed company name, DoI removed
1.6b	2020-04	Company name change, corrections
1.6c	2022-10	Adjustment pressure scale FD120

Table of Contents

1 General Information

Information about safety regulations, symbols, copyrights, protection rights, usage location conditions and notes on resistance welding can be found in the back section of these operating instructions.

Please read this information carefully before using these operating instructions.

These operating instructions should help you familiarize yourself with the system and take advantage of its application possibilities when used as directed.

It contains important notes to help operate the unit safely, properly, and economically.

Observing the notes will help avoid risks, decrease repair costs and down times, and enhance reliability and the service life of the unit.

Warning

It is a rule: **Safety first!**

Danger

Incorrect or inappropriate configuration, installation, settings, handling or use can cause mechanical, electrical or thermal hazards, which may result in serious damage or injury.

Ensure the correct execution of these points and follow the respective notes in the operating instructions.

Do not put the system into operation before you have read the **operating instructions**!

Danger

Persons with **cardiac pacemakers** and **metallic implants** are prohibited from approaching to within a radius of **at least 5 m** of welding equipment!

Warning

Crushing Hazard
There is a risk of crushing during the adjustment movement due to closing electrodes, stops for limiting adjustment or stroke movement and the stop on the basic pincers unit for limiting floating movement.

Warning

This **Class A welding equipment** is not supposed to be used in living quarters, where the power supply is carried out by a public low voltage supply.

There it can be difficult to ensure electromagnetic compatibility because of conducted or radiated disturbances.

2 Technical Description

2.1 Overview of Variants

The welding force settings with welding head product series F120 and F160 occur either by hand with a knurled screw, with different spring strengths and **scale housing** or pneumatically, with proportional valve and **support cylinder**.

Version for **automation**: The welding heads don't have neither stand nor lower electrode but a defined interface. The mounting, e.g. in a plant, occurs by customer.

Variants						Versions
1. Welding heads with scale housing						
F120-S			**F160-S**			**S** = **S**tandard
F120-SM			**F160-SM**			**M = M**echanically actuated
F120-SH			**F160-SH**			**H** = with lower stroke cylinder
F120-SZ			**F160-SZ**			**Z** = acting as floating pincers
F120-SZ	**R**ight	**L**eft	**F160-SZ**	**R**ight	**L**eft	
Addendum:	-RWG	-LWG	Addendum:	-RWG	-LWG	Horizontal (**W**), welding electrode 20°, counter electrode straight (**G**)
	-RWV	-LWV		-RWV	-LWV	Horizontal, both electrodes 20° (**V**-shaped)
	-RSG	-LSG		-RSG	-LSG	Vertical (**S**), welding electrode 20°, counter electrode straight
	-RSV	-LSV		-RSV	-LSV	Vertical, both electrode 20° (**V**-shaped)
1.1. Twin head with 2 scale housings						
FD120-S						Standard
FD120-M						Mechanically actuated
FD120-H						with lower stroke cylinder
1.2. Twin weld pincers with 2 scale housings						
			F160-DZ			acting as floating double-pincers
2. Welding heads with support cylinder						
F120-15	(-30; -80; -150)		**F160-240**	F160-550		
F120-15-M	(-30; -80; -150)		**F160-240-M**	F160-550-M		**M**echanically actuated
F120-15-H	(-30; -80; -150)		**F160-240-H**	F160-550-H		with lower stroke cylinder (**H**)
F120-15-Z	(-30; -80; -150)		**F160-240-Z**	F160-550-Z		acting as a floating pincers (**Z**)
F120-xx-Z	**R**ight	**L**eft	**F160-xx-Z**	**R**ight	**L**eft	
Addendum:	-RWG	-LWG	**Addendum:**	-RWG	-LWG	Horizontal (**W**), welding electrode 20°, counter electrode straight (**G**)
	-RWV	-LWV		-RWV	-LWV	Horizontal , (**W**)both electrodes 20° (**V** shaped)
	-RSG	-LSG		-RSG	-LSG	Vertical (**S**), welding electrode 20°, counter electrode straight (**G**)
	-RSV	-LSV		-RSV	-LSV	Vertical (**S**), both electrode 20° (**V** shaped)
2.1. Twin head and 2 support cylinders						
FD120-15	(-30; -80; -150)					
2.2. Twin weld pincers and 2 support cylinders						
			F160-**DZ** (-240; -550)			acting as floating double-pincers

2.1.1 Technical Description

2.1.1.1 Heads / Pincers F120 and F160 with Scale Housing

	F120-S F120-H	F120-M	F120-Z	F160-S F160-H	F160-M	F160-Z F160-DZ
Welding force (depending on spring)	15 – 150 N (option with 0 spring: 1.2 – 15 N)			50 – 550 N		
Electrical power output limit	5 kA (2 kA with light current band)			5 kA		
Power input, closing stroke	pneumatic	mechanical	pneumatic	pneumatic	mechanical	pneumatic
Power input, welding pressure	Via pre-tensioned spring					
Power adjustment	Manual with adjusting screw on scale housing					
Electrode holder	Brass quick-change bracket (or aluminum/gold-plated for F120 with 0 spring)					
Electrode shape	6 mm cylindrical		quadratic 7.5 mm²	6 mm cylindrical		quadratic 7.5 mm²
Electrode stroke (max.)	Welding electrode 25 mm Lower electrode for – H: 25 mm			Welding electrode 30 mm Lower electrode for – H: 30 mm		
Weight (without secondary cable)	approx. 5.5 kg	approx. 1.5 kg	approx. 11 kg	approx. 8 kg		approx. 15 kg
Maximum stroke	6 bar					

2.1.1.2 Heads FD120 with Scale Housing

	FD120-S FD120-H	FD120-M
Welding force (depending on spring)	15 – 150 N (option with 0 spring: 1.2 – 15 N)	
Electrical power output limit	5 kA (2 kA with light current band)	
Power input, closing stroke	pneumatic	mechanical
Power input, welding pressure	Via pre-tensioned spring	
Power adjustment	Can be separately adjusted manually on both scale housings using the adjusting screw	
Electrode holder	Adjustable distance (max. 10 mm) between the two electrodes	
Electrode shape	6 mm cylindrical	
Electrode stroke (max.)	Welding electrode 25 mm Lower electrode for –H: 25 mm	
Weight (without secondary cable)	approx. 6 kg	
Maximum stroke	6 bar	

2.1.1.3 Heads and Pincers F120/FD120 with Support Cylinder

	-15 -15-H -15-M -15-Z	**-30 -30-H -30-M -30-Z**	**-80 -80-H -80-M -80-Z**	**-150 -150-H -150-M -150-Z**
Welding force (dep. on spring)	1,2 – 15 N	10 – 45 N	18 – 90 N	45 – 150 N
Electrical power output limit	2 kA	5 kA		
Power input, closing stroke	F120 (-H, -Z) pneumatic F120-M mechanical			
Power input, welding pressure	Via pneumatically pre-tensioned spring			
Power adjustment	Via proportional valve by welding power control			
Electrode holder	Brass quick-change bracket (or aluminum/gold-plated for F120/FD120 with spring 0)			
Electrode shape	F120 (-H, -M) 6 mm cylindrical F120 Z quadratic 7.5 mm²			
Electrode stroke (max.)	Welding electrode 25 mm; lower electrode for – H: 25 mm			
Weight (without secondary cable)	-S: approx. 5.5 kg -H: approx. 5.5 kg -M: approx. 1.5 kg -Z: approx. 11 kg	-S: approx. 6.0 kg -H: approx. 5.5 kg -M: approx. 2.0 kg -Z: approx. 11 kg	-S: approx. 6.5 kg -H: approx. 5.5 kg -M: approx. 2.5 kg -Z: approx. 11 kg	-S: approx. 7.0 kg -H: approx. 5.5 kg -M: approx. 3.0 kg -Z: approx. 11 kg
Maximum stroke	6 bar			

2.1.1.4 F160 / F160-DZ with Support Cylinder

	-240 -240-H -240-M -240-Z	**-550 -550-H -550-M -550-Z**
Welding force (dep. on spring)	50 - 240 N	150 – 550 N
Electrical power output limit	5 kA	
Power input, closing stroke	F160 (-H, -Z) pneumatic F160-M mechanical	
Power input, welding pressure	Via pneumatically pre-tensioned spring	
Power adjustment	Via proportional valve	
Electrode holder	Brass quick-change bracket	
Electrode shape	F160 (-H, -M) 6 mm cylindrical F160 Z quadratic 7.5 mm²	
Electrode stroke (max.)	Welding electrode 30 mm Lower electrode for – H: 30 mm	
Weight (without secondary cable)	F160 approx. 8 kg F160-H approx. 12 kg F160-M approx. 6 kg F160-Z approx. 12kg	
Maximum stroke	6 bar	

2.2 Structure and Function

2.2.1 Structure and Function with Scale Housing

2.2.1.1 Standard Head (-S)

Pneumatically-actuated welding heads with scale housing consist of:

- a guide head in which the guide column is mounted in ball bearing sleeves for minimum friction
- a dual-action adjustment unit with stop and valve
- a scale housing for the F120/F160, or two scale housings for the FD120, on which the welding force can be manually adjusted with an adjusting screw
- welding pressure springs, strength classification 0 - 3 for the F120, 1-4 for the F160
- the current band
- an extra smooth-running current band (for use of welding pressure spring with strength classification 0 in the F120/FD120),
- a stand, or no stand in the automated head version
- the electrode arm bracket with connections for the secondary cables,
- the electrode holders or quick-change brackets
- the pair of electrodes

2.2.1.2 Head with Lower Stroke Cylinder (-H)

The version with a lower stroke cylinder also contains:

- a stroke cylinder which adjusts the counter electrode
- a stand for mounting the stroke cylinder

2.2.1.3 Head with Mechanical Actuation (-M)

Welding heads with mechanical actuation consist in addition of standard version:

- a return stroke spring with stop
- a mechanical adjustment unit with which welding head actuation can be realized (e.g. by a traction or sliding rod)

2.2.1.4 Pincers with Scale Housing (-Z)

Pneumatically-actuated welding pincers consist of:

- a guide head in which the guide column is mounted in ball bearing sleeves for minimum friction
- a dual-action adjustment unit with stop and valve
- a scale housing for the F120/F160-SZ, resp. two scale housings for F160-DZ, on which the welding force can be manually adjusted with an adjusting screw
- welding pressure springs, strength classification 0 - 3 for the F120, 1-4 for the F160
- the current band
- an extra smooth-running current band (for use of welding pressure spring with strength classification 0 in the F120/FD120),
- the electrode arm brackets with connections for the secondary cables,
- the electrode holders or quick-change brackets
- the pair of electrodes
- a basic pincers unit for vertical or horizontal installation, on which the electrodes move in a floating manner or as a result of a defined counter electrode adjustment function
- a locking cylinder with valve
- a mechanism which governs a defined welding pincers starting position

2.2.2 Structure and Function with Support Cylinder

2.2.2.1 Standard Support Cylinder (-S)

The pneumatically-actuated welding head with support cylinder consists of:

- a guide head in which the guide column is mounted in ball bearing sleeves for minimum friction
- a dual-action adjustment unit with stop and valve
- one of four different support cylinder for the F120 for pneumatic pre-tensioning of welding pressure springs 0 - 3
- one of four different support cylinder for the FD120 for pneumatic pre-tensioning of welding pressure springs 0 - 3
- one of two different support cylinder for the F160 for pneumatic pre-tensioning of welding pressure springs in the range 50 – 240 N and 150 – 550 N
- a stand, or no stand in the automated head version
- the current band
- the electrode arm bracket with connections for the secondary cables
- the electrode holders or quick-change brackets
- the pair of electrodes

2.2.2.2 Head Support Cylinder with Lower Stroke Cylinder (-H)

The version with a lower stroke cylinder also contains:

- a stroke cylinder which adjusts the counter electrode
- a stand for mounting the stroke cylinder

2.2.2.3 Head Support Cylinder with Mechanical Actuation (-M)

Welding heads with mechanical actuation consist in addition of standard version:

- a return stroke spring with stop
- a mechanical adjustment unit with which welding head actuation can be realized (e.g. by a traction or sliding rod)

2.2.2.4 Pincers (-Z) with Support Cylinder

Pneumatically-actuated welding pincers also consist of:

- a guide head in which the guide column is mounted in ball bearing sleeves for minimum friction
- a double-action adjustment cylinder with stop and valve
- one of four different support cylinder for the F120 for pneumatic pre-tensioning of welding pressure springs 0 - 3
- two of four different support cylinder for the FD120 for pneumatic pre-tensioning of welding pressure springs 0 - 3
- one of two different support cylinder for the F160 for pneumatic pre-tensioning of welding pressure springs in the range 50 – 240 N and 150 – 550 N
- two of two different support cylinder for the F160-DZ for pneumatic pre-tensioning of welding pressure springs in the range 50 – 240 N and 150 – 550 N
- the current band
- the electrode arm bracket with connections for the secondary cables
- the electrode holders or quick-change brackets
- the pair of electrodes
- a basic pincers unit for vertical or horizontal installation, on which the electrodes move in a floating manner or as a result of a defined counter electrode adjustment function
- a locking cylinder with valve
- a mechanism which governs a defined welding pincers starting position

3 Commissioning

3.1 Mechanical Connections

3.1.1 Adjustment Cylinder

Caution

Compressed air should always be deactivated when connecting the plug-in hoses.

The adjustment cylinders on all pneumatic welding heads and welding pincers are connected to the 5/2-way valve with a pneumatic plug-in hose (outer diameter 6 mm).

Illus. 1: Pneumatic connection of welding cylinder (typical)
and pressure sensor for version with proportional valve control

Illus. 2: Pneumatic connection of adjustment cylinder (typical)

- Connect the upper exhaust throttle of the adjustment cylinder to connection A on 5/2-way valve
- Connect the lower exhaust throttle of the adjustment cylinder to connection B on 5/2-way valve

The closing speed should be corrected with the lower exhaust throttle so that the electrode makes contact with the weld material without impacting during the closing time.

The return stroke speed can be corrected with the upper exhaust throttle so that the welding head is retracted just as much without impacting.

3.1.2 Support Cylinder

Caution

Compressed air should always be deactivated when connecting the plug-in hoses.

The version with the support cylinder uses this cylinder to tension the welding pressure spring.
Connect the proportional valve and pressure sensor to the support cylinder.

Illus. 3: Pneumatic connection of support cylinder (F160 in this case)

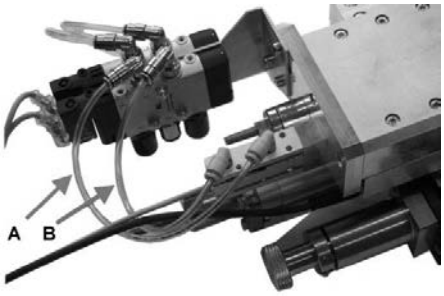
3.1.3 Locking Cylinder

Caution

Compressed air should always be deactivated when connecting the plug-in hoses.

The locking cylinder attached to the F120Z and F160Z welding pincers is connected to the second 5/2-way valve with a pneumatic plug-in valve (outer diameter 4 mm).

- Connect the upper exhaust throttle of the locking cylinder to connection A on the 5/2-way valve
- Connect the lower exhaust throttle of the locking cylinder to connection B on the 5/2-way valve



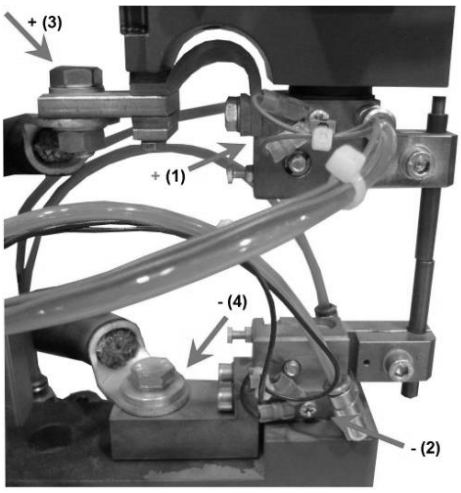
Illus. 4: Pneumatic connection of locking cylinder (typical)

3.1.4 Pneumatic Control

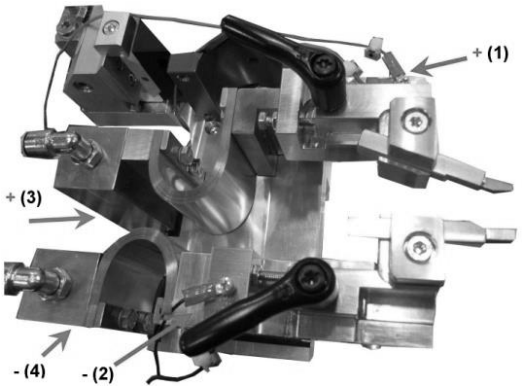
All pneumatic controls are **options** and are mounted in dependence of the control.

3.2 Electrical Connections

3.2.1 Secondary Cable Connections



Illus. 5: Secondary cable connection for weld heads (example)



Illus. 6: Secondary cable connection for pincers (example)

- Connect a secondary cable to the connection intended for this purpose behind the current band and to the (+) pole (3) of your welding power control
- Connect a secondary cable to the connection intended for this purpose on the lower electrode holder and to the (-) pole (4)of your welding power control
- A reverse connection of the poles can be advantageous, depending on the application involved.

Caution

Please ensure the following to maintain as low a current resistance in the secondary circuit as possible:

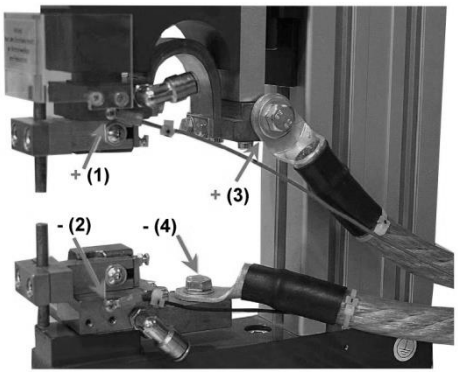
- The cable lugs should make contact with the mounted component over as great a surface area as possible
- Secondary cables should be laid as closely as possible and bound with cable binders to maintain a limited secondary window
- Secondary cables should not be contacted to other parts conducting current and should not form shunt circuits
- Contact surfaces should be clean
- Contact surfaces should not be corroded
- Screw connections should not loosen during operation

The attachment of a second (third) secondary cable to each pole increases the cable cross section, thus reducing the current resistance. The shorter the secondary cable, the lower the conducting loss.
A considerable loss should be expected where cables longer than 1.5 m are used.

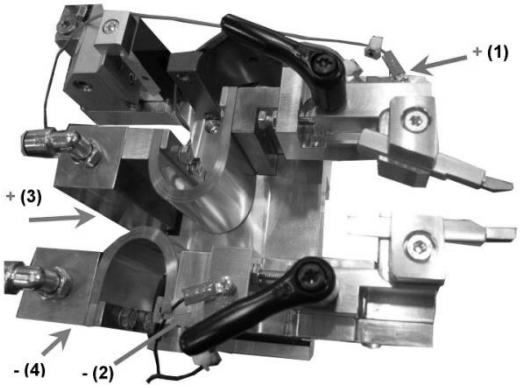
Reversed pole connection can be advantageous, depending on the application involved. Voltage is created by the Peltier effect when welding materials which are widely disparate in terms of the electrical voltage sequence. This voltage is added to the voltage of the welding power control (recommended) or acts against it, depending on the secondary cable pole configuration. A secondary cable pole configuration which suits your particular application should therefore always be selected.

3.2.2 Voltage Measurement

	The voltage measuring cable is part of the power control or measuring unit scope of delivery. Correct attachment is always necessary if work is conducted with voltage or power control.
Attention	**Take care** to position the threaded holes as close to the electrodes as possible without compromising their stability! **Ensure** that the water cooling (optional) is not inadvertently drilled.



Illus. 7: Connection weld head (example)



Illus. 8: Connection weld pincer (example)

Connect the red voltage cable (+) with point (1) on the upper electrode and the black voltage cable (-) with point (2) on the lower electrode.

Insert one of the 5-pole connectors in the corresponding socket of the power control and the second in the measuring unit (optional).

3.2.3 Current Measurement

Attention

The current coil is part of the power control or measuring unit scope of delivery.

Ensure that only the supply line of the secondary current is enclosed by the coil.
The coil may never enclose supply and return line of the secondary current.

A current measuring coil has to be built-in in the secondary circuit for all inverters with external main stage. (default: Toroid ring coil ø 70 mm, No. 770.60 152).

Coils of various types for current measurement are provided

Of particular importance is the amplification factor of the coil.
You can take the amplification factor (1:1 or 1:10) from the identification plate resp. the technical data sheet of the coil. You have to consider the amplification factor within the measuring result.

Illus. 9: Ring toroid coil (example) with (+) side symbol

Illus. 10 Flap toroid coil (example) with (+) side symbol

The direction of current and, therefore, coil installation direction is important in order to ensure correct current reading.

Ensure that the correct coil fitting position is selected during installation!

Ring toroid coil

Illus. 11: Toroid ring coil

Flap toroid coil

Illus. 12: Built-in flap toroid coil

- Install the flap toroid coil or toroid ring coil on the (+) line of the current source.
  Ensure that the (+) side of the coil points in the direction of the current source (+) terminal.
  Ensure that all secondary cables of a pole are enclosed.
- Connect the cable for current measurement to coil.
- Insert the 3-pole connector in the corresponding socket of the power control or measuring unit.

3.2.4 Displacement Measurement

Attention

Please note the adjusting guidelines for the displacement measuring (see power control or measuring unit).

Otherwise the displacement sensor may be damaged.

The displacement measurement sensor is part of the scope of delivery of the power control or the measuring unit.

With the displacement sensor you can check the displacement of the electrode during welding and testify the welding quality.

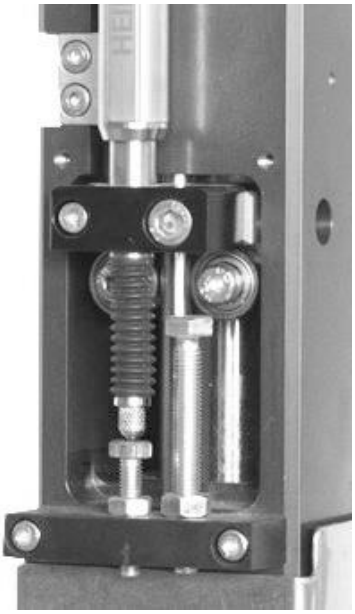
Moreover you can disconnect the weld current with this option.

Mounting kits for distance measuring sensors are optionally available and are not enclosed in the scope of delivery.

The displacement sensor has a maximum measuring path of 10 mm. The stroke of the active electrode is a maximum of 30 mm. The displacement sensor must therefore always be adapted to the current stroke and must be readjusted when the stroke changes.

The stop screw must always be adjusted so that the displacement sensor cannot be damaged

To ensure that the measurement result is correct, the displacement system has to be mechanically isolated from the welding head.



Illus. 13: Displacement system w/o cover

Illus. 14: Built-on, isolated displacement system

- The displacement system should only be mounted with an add-on set approved by AMADA WELD TECH GmbH
- Connect the displacement system with the adapter and insert this into the corresponding socket on the power control or measuring unit.

3.2.4.1 Supply Briefings for Displacement

Only applicable for F120-M / F160-M with distance measuring.

Attention

It is imperative when dealing with heads with mechanical foot pedal actuation that the spring-mounted system settles before an evaluation with the distance measuring system can be carried out.

It is necessary to work **always** with a squeeze time in this respect.
Otherwise the sensor may be damaged.

When a **4G35-2** power control is used it should be set to
"**first and second pulse**",
the first pulse being used for the squeeze time and set to the following values:

First pulse: Ramp time 99 ms
On-time 99 ms
Decay time 99 ms
Current strength 0000 A

This gives a squeeze time of approx. 300 ms

The actual welding operation can then be carried out with the second pulse (and only the second pulse) while using the distance measuring system.

3.2.5 Proximity Switches

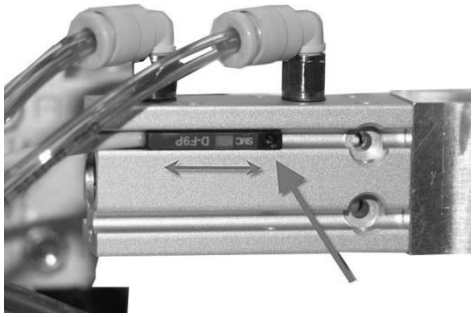
All proximity switches are **optional** and are fitted depending on the control used. The following preferential types are used:

Caution

Risk of injury!

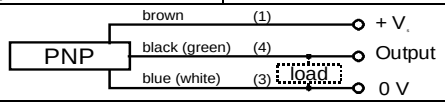
Switch off system before adjusting the proximity switches!

Illus. 15: Place of initiator (example)



Illus. 16: Place of initiator (example)

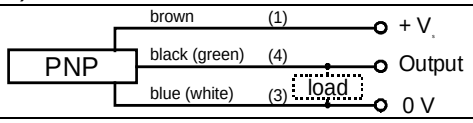
3.2.5.1 Proximity Switch “Head cushioned”

Function: *Head cushioned*	**F120** Article no. 770.66 221 IFRM 08P1301	**F160** Article no. 770.60 895 IFFM 08P1501/01
Type:	PNP, make contact, NO	PNP, make contact, NO
Working triggering distance S_n:	4 mm	1.5 mm
Voltage range +V_s:	10 - 30 V DC	10 – 30 V DC
Maximum load current:	200 mA	200 mA
Voltage drop V_d:	< 3 V	< 3 V
Dimensions:	M8x1 (SW13), L 52 mm	8 x 8 mm □; L 59 mm
Circuit diagram:		

The “**head-cushioned**”- proximity switch should always be set so that the LED illuminates as soon as the anti-torsion protection rises.
The proximity switch should be continually suppressed during the welding operation, as the welding current will otherwise be activated too early.

3.2.5.2 Proximity Switch“Head / Pincers back”

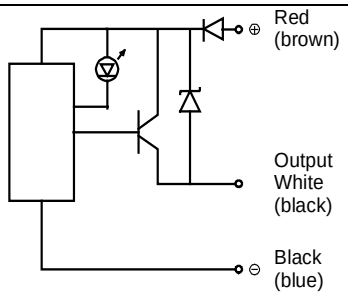
Series F120: The proximity switch is mostly situated at the adjustment cylinder.
Series F160: The proximity switch is situated behind the scale housing or the support cylinder.

Function: *Head back / pincer back*	**F120 / F160** Article no. 770.60 786 IFRM 08P1703
Type:	PNP, make contact, NO
Working triggering distance S_n:	2 mm
Voltage range +V_s:	10 - 30 V DC
Maximum load current:	200 mA
Voltage drop V_d:	< 3 V
Dimensions:	M8x1 (SW13), L 52 mm
Circuit diagram:	

The “**head back**” proximity switch should always be set so that the LED illuminates if the welding head / pincers is in the rest position.
This signal is evaluated during an automated sequence.

3.2.5.3 Proximity Switch “Pincers locked”

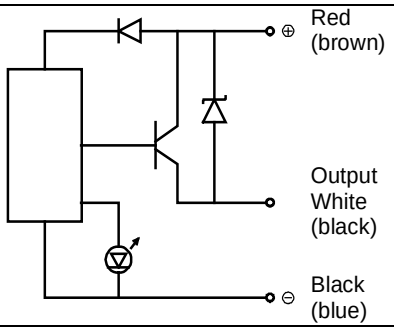
The proximity switch is situated at the locking cylinder.

Function: *Pincers locked*	**F120 / F160** Article no. 770.06 994 D-F9PL
Voltage range +V_s:	10 - 28 V DC
Maximum load current:	<50 mA
Voltage drop V_d:	< 1.5 V
Dimensions:	∅4 x 26.5 mm
Circuit diagram:	

The “**Pincers locked**” proximity switch should always be set so that the LED illuminates if the welding pincers is in the rest position. This signal is evaluated during an automated sequence.

3.2.5.4 Proximity Switch “Stroke cylinder ahead / back”

The proximity switch is situated at the bottom of the stroke cylinder.

Function: *Stroke cylinder ahead / stroke cylinder back*	**F120-H / F160-H** Article no. 770.60 786 D-F7PL
Voltage range +Vs:	4.5 - 28 V DC
Maximum load current:	<100 mA
Voltage drop Vd:	< 0.8 V
Dimensions:	27.6 x 15 x 11.8 mm
Circuit diagram:	

The “**stroke cylinder back**” proximity switch should always be set so that the LED illuminates if the stroke cylinder is in the rest position.

This signal is evaluated during an automated sequence and generally signals the end of a welding sequence.

The “**stroke cylinder ahead**” proximity switch should always be set so that the LED illuminates if the stroke cylinder has reached the upper stroke position.
This signal is evaluated so as to subsequently adjust the welding head.

3.3 Initial Commissioning

3.3.1 Preconditions

Mechanical preconditions:

- The welding head should be mounted securely and in a stable manner on a table or frame
- Safety instructions and notes for resistance welding should be heeded
- Ascertain that all connections are correctly fitted
- If necessary ensure cooling water inlet

Electrical preconditions:

- All fuses must be fitted and in good order, if available
- Primary start may not be closed
- An emergency stop may not be activated
- Make sure that all connections are installed correctly

 **Warning**	If you work with low welding pressure and high currents, the weld material can tend to form splashes. Set the welding pressure if possible in a manner which avoids splashing.
	Wear protective glasses and protective clothing!

3.4 Activating

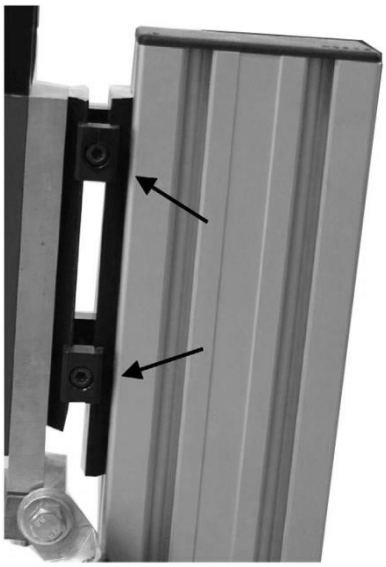
 **Caution**	The cylinders move to their home positions when the compressed air is activated for the first time.
	**Crushing hazard!** Ensure that a safe distance is maintained to the welding head.
	The welding head itself is only passively actuated. Note the power and sequence control operating instructions during operation.

3.5 Settings

3.5.1 Position of Welding Head

The welding head is connected to the stand with a dovetailed clamp fixture. The height of the welding head can be altered by loosening the screws.

- Always set the welding head height so that the distance between the electrode and weld material always has the shortest possible dimension.
- Ensure that the terminals are as far apart as possible. Always use at least two terminals.
- The screws should be subsequently firmly tightened.



Illus. 17: Dovetailed clamp on stand (typical)

3.5.2 Setting the Electrodes

The electrodes should stand vertically and be aligned in relation to each other. Tighten the screws.

The electrode distance depends on the individual characteristics of your components.

Set the electrode distance in the open state as short as possible for safety reasons (< 6 mm).

Check that all components of the secondary circuit are mechanically fixed.

Check whether the current strap is in direct contact with the stand due to an unfavourable position of the guide head or due to the twisting of the upper arm holder.

In this case, correct this to avoid the risk of shunt.

3.5.2.1 Setting the Electrodes with an Adjusting Gauge

The position of the electrodes in the quick-action bracket is set with the optionally-available adjusting gauge. The advantage of this is that the welding head stop need not be readjusted.
Loosen the quick-action electrode holder clamp for this purpose and remove the bracket together with the electrodes.

Replace the worn electrodes with a newly-set pair of electrodes and quick-action bracket so that operation can be continued as quickly as possible.

3.5.3 Setting the Stop (Cushioning)

Procedure:

The mains pressure of maximum 6 bar builds up in the support cylinder in the pneumatically-actuated welding heads during the adjusting time. The cylinder presses the guide head downwards, so that the electrode resting on the component is cushioned against the pre-tensioned welding pressure spring. This procedure is realized by actuating a foot pedal or mechanism when dealing with a head with mechanical adjustment (e.g. F120-M).

Spring deflection (cushioning) of the welding head is limited by a **stop** on the support cylinder or spring housing of the retraction spring.

The anti-torsion protection connected to the guide column rises from the housing during spring cushioning if the stop is set correctly. The proximity switch integrated in the guide head is suppressed by the anti-torsion protection and the LED illuminates.

Caution

The stop must always be readjusted to suit the new conditions if you change the position of the electrodes or the work piece's thickness!

Proceed as follows:

- Set the control to **step mode**. (See operating instructions on power and/or sequence control)
- Release the locking nut and stop from each other
- Turn the stop clockwise in the direction of the support cylinder
- **Insert the weld material** (the thickness of the unprocessed weld material must always be taken into consideration when setting the welding head)

Illus. 18: Stop with locking nut - F160 (typical)

For version **F160-M** with footpedal the stop is located under the housing.

- Turn stop screw upwards, that the housing drop the stop and the anti-torsion protection deflects.

Illus. 19: Stop with locking nut - F160-M (typical)

- Actuate Start (or actuate the mechanism). The welding head moves to the screwed down stop. The electrode **does not** touch the weld material **yet**
- Turn the stop back in an anti-clockwise direction under the actual welding pressure. The electrode comes to rest on the weld material
- Turn the stop further back in an anti-clockwise direction and check how the anti-torsion protection rises from the housing. The head deflects and the anti-torsion protection approaches the proximity switch
- The LED on the proximity switch begins to illuminate

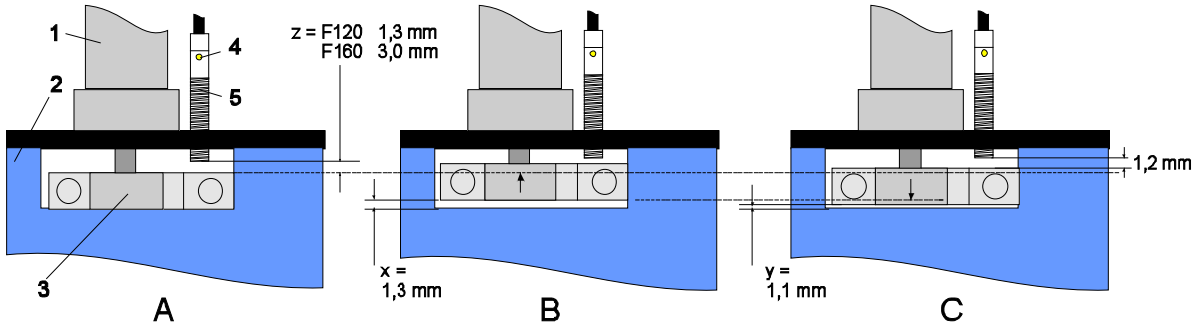
Illus. 20: Deflected FD120 with support cylinder (typical)

- Turn the stop even further back so that the anti-torsion protection does not touch the cylinder base nor leave the triggering range of the proximity switch during the welding procedure
- Lock the stop with the locking nut

Illus. 21: F160 with scale housing and proximity switch (“Cushioned head”)

Ensure that the anti-torsion protection is not cushioned to such an extent that it impacts at the top against the support cylinder / spring housing, as the entire spring force will otherwise not be available.

Set the distance for F120-weld heads to **1.3 mm** and for F160-weld heads to **2 mm**.



Illus. 22: Operating distance

A = Idle position	B = Cushioned position	C = Position after welding

1 = Cylinder
2 = Housing
3 = Anti.torsion protection
4 = Light emtting diode (LED)
5 = Initiator

x – y = Penetration of electrode
Example: 0.2 mm

z = Operating-distance:
F120: 1.3 mm
F160: 2.0 mm
Example: 1.2 mm

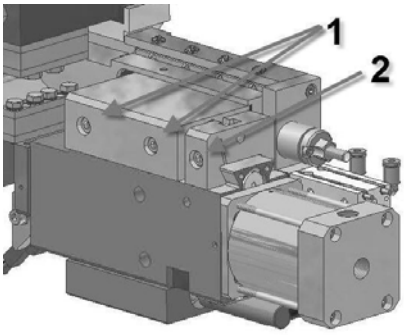
Caution

Ensure that the anti-torsion protection still suppresses the proximity switch **after** the welding operation is completed. The anti-torsion protection should be in the monitored range (triggering range) of the proximity switch at all times during the welding operation, as the welding current will otherwise be activated too early.

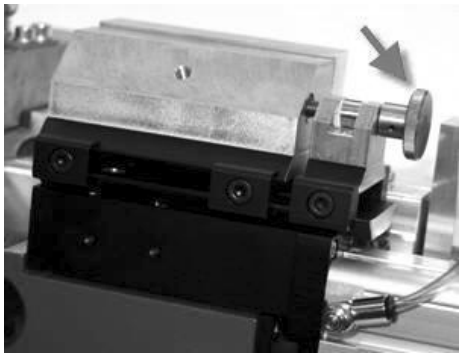
3.5.4 Setting the Weld Pincers

3.5.4.1 Setting the Electrode Opening

Proceed as follows to change the electrode distance:



Illus. 23: Clamp screws weld pincer (typical)



Illus. 24: Clamp and adjusting screw for the electrode distance (typical)

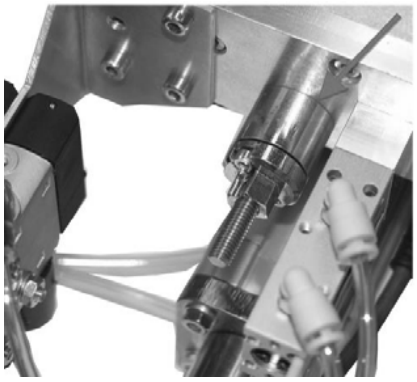
Loosen the clamping screws (1) on the floating basic pincers unit. The third right clamping screw (2) below the adjusting screw must remain fixed.

Now set the desired electrode distance with the adjusting screw.

3.5.4.2 Setting the floating movement

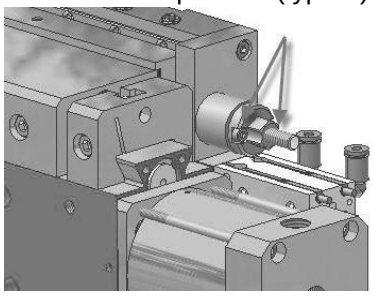
The mechanism of a locking cylinder ensures that the welding pincers are locked in the **rest position**.

The floating movement of the welding pincers is limited by the stop screw.



Illus. 25: Stop screw (typical)

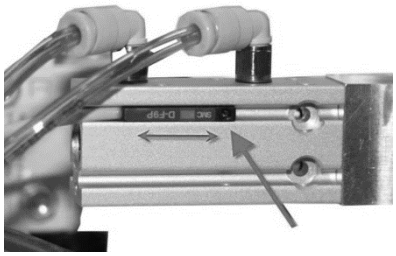
- To adjust, loosen the two clamping screws on the stop screw
- Turn the stop into the desired position.
- Lock the stop with the two clamping screws.



Illus. 26: Clamping screws

The stroke of the locking cylinder is altered relative to a **change** in the floating movement.

The position of the proximity switch on the locking cylinder must therefore be readjusted so that the LED on the proximity switch illuminates when the pincers is open / locked.

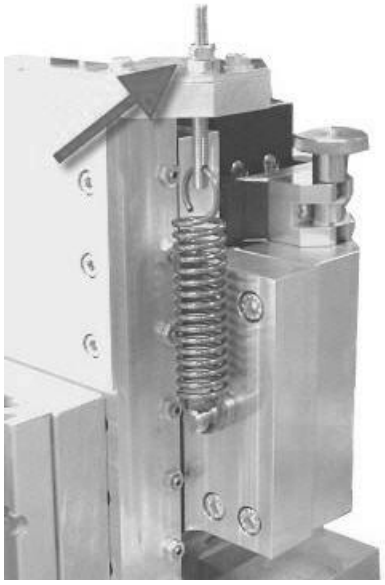


Illus. 27: Proximity switch on locking cylinder (typical)

3.5.4.3 Setting in Vertical Position

The weight of the welding pincers must be compensated for with a traction spring when installing welding pincers vertically. This is necessary to retain the floating movement function.

- Loosen the two upper nuts to counterbalance the weight.
- Turning the nuts clockwise relieves the weight of the pincers. This means that the counter electrode is raised further. Set this stroke movement so that the counter electrode is drawn toward the weld material from below without subjecting the component to excess pressure.
- The nuts should be subsequently locked again.



Illus. 28: Relief fixture for welding pincers in vertical installation position (typical)

3.5.5 Changing the Welding Pressure Spring

3.5.5.1 Spring Changing with Scale Housing

- Relieve the tension on the fitted pressure spring (turn the adjusting screw to “zero”)
- Loosen the four fixing screws on the scale housing and lift off the scale housing
- Change the spring and fit the washer on the end of the spring.
- Remount the scale housing with the spring and washer again and tighten the four screws firmly

Checking the welding pressure

Springs should be checked relative to the setting scale, as each spring is affected by a slight tolerance. You will need a spring balance or dynamo meter to measure the actual welding pressure.

- Turn the adjusting screw to 10 scale graduations. A reference to the diagram shows that, for example, spring no. 2 on the F120 generates approximately 50 Newton [N] welding pressure at ten scale graduations
- Suspend a dynamo meter on the electrode holder (bracket complete with electrode) and measure the spring force with it until the electrode holder rises and the anti-torsion protection is in the triggering range of the “head cushioned” proximity switch
- Welding spring pre-tension should be corrected if the measured value deviates from the illustrated value

Correcting the welding pressure spring pretension

- Tighten the clamping screw for the adjusting screw so that the scale value cannot be offset
- Now unscrew the safety screw from above out of the adjusting screw with a hexagonal wrench
- A grub screw is located below this safety screw. The spring pretension can be altered by screwing the grub screw in/out
- Measure several times (measurements can also be taken at different scale settings)
- The grub screw setting should be ultimately locked with the safety screw

Slight deviations of the scale specifications from the actual measurement value can occur as a result of tolerances which arise during spring manufacturing.

3.5.5.2 Changing the Welding Pressure Spring with Support Cylinder

Support cylinders are adapted to suit the respective welding pressure spring used.

The spring and support cylinder must always be changed together to achieve another force range.

Caution

Compressed air should always be deactivated when releasing or connecting the pneumatic plug-in hoses.

- Release the pneumatic hose
- Loosen the fixing screws on the support cylinder and lift it off carefully
- Change the spring and cylinder.
- Remount the support cylinder with the spring and washer again and tighten the screws firmly
- Connect the pneumatic hose again

Slight deviations of the pressure diagram specifications from the actual measurement value can occur as a result of tolerances which arise during spring manufacturing.

We recommend that the exact force be determined on site.

3.6 Basic Settings

3.6.1 Setting the Welding Force

The adjustment of the welding force is done according to the type

- by the **selected scale setting** on the scale housing or
- by the **set air pressure** in the force setting cylinder by means of a pneumatically adjustable pressure valve, proportional valve, single valve or valve bar, which compresses the welding pressure spring.

The welding force can be read in a diagram on the scale housing, welding head or pincers.

The correct welding force for the welding task must be determined through several trial welding operations. A generally-applicable rule is that the weld material does not splash when the correct welding force is set.

Always commence a new trial sequence with a higher welding force and optimize the result by reducing the welding force.

Background: the higher the welding force, the lower the transitional resistance between the components and the weaker the weld.

3.6.1.1 Scale housing force setting

- Loosen the locking screw
- Set the required welding force by turning the knurled screw
- Lock the knurled screw with the locking screw

Illus. 29: F120 scale housing for setting the welding force (similar in principle to the F160)

3.6.1.2 Support cylinder force setting

Specify an air pressure value on the control. The welding pressure spring is suitable pre-tensioned in the support cylinder via a proportional valve. Read also the control operating instructions in this respect.

Please read additionally the operating instructions of the control!

4 Sequence

Please familiarize yourself with the description of a welding sequence below so as to be in a position to optimally adjust the welding head or welding pincers.
The sequence with the **FD** twin welding head is equivalent to that of the single head.

The following applies to all sequences:
All times depend heavily on the **ambient conditions** and the **welding task**. The **optimum** setting of a system must be determined through a series of trials to achieve qualitatively high and reproducible welding results.

4.1 Sequences of a Welding Cycle

Different springs can be fitted in the **scale housing** for different force ranges.

The **support cylinder** is adjusted to particular the spring and is triggered via proportional valve. There is the possibility by changing the welding program to produce a different welding force within the force range of the spring.

The **Test or Jog mode without current** program mode should be selected in the control for **adjusting** and **set-up** of the welding head. See the operating instructions for sequence and power control in this respect

Variant S, M	Variant Z	Variant H	Variant M
	Mains pressure is applied to the locking cylinder when the sequence commences. This holds the pincers in a defined open position. The "**pincers locked**" proximity switch is activated.		The sequence is similar to the standard welding head, but welding head adjustment is realized mechanically, e.g. with levers, traction or sliding rods (see also 3.5.3 "Setting the stop").
• **Supply the weld material. Observe safety regulations. Trigger Start**			
The adjusting valve triggers the **mains pressure** (6 bar) directly on the adjustment cylinder.	The mechanism on the **locking cylinder** enables the welding pincers when the valve switches. The welding pincers electrodes now move free floating towards the basic pincers unit. The "**Pincers locked**" proximity switch is deactivated. The **mains pressure** is simultaneously applied to the adjustment cylinder. The pincers closes.	Air is applied to the stroke cylinder, the lower electrode is adjusted and the „**Stroke cylinder back"** proximity switch is deactivated. The „**Stroke cylinder ahead"** now transmits a signal and the welding head is adjusted accordingly	

- The **closing** and **squeeze time** (= adjustment time) sequence begins. The adjustment time should continue until the head is cushioned. The closing and return stroke speed is set with the two exhaust throttles on the adjustment cylinder.
  Set the throttles so that the electrode comes to rest on the weld material without impacting
- The spring is flattened further while the cylinder moves to an adjustable stop (see Chapter 3.5.3“Setting the stop”)
- **with scale housing**

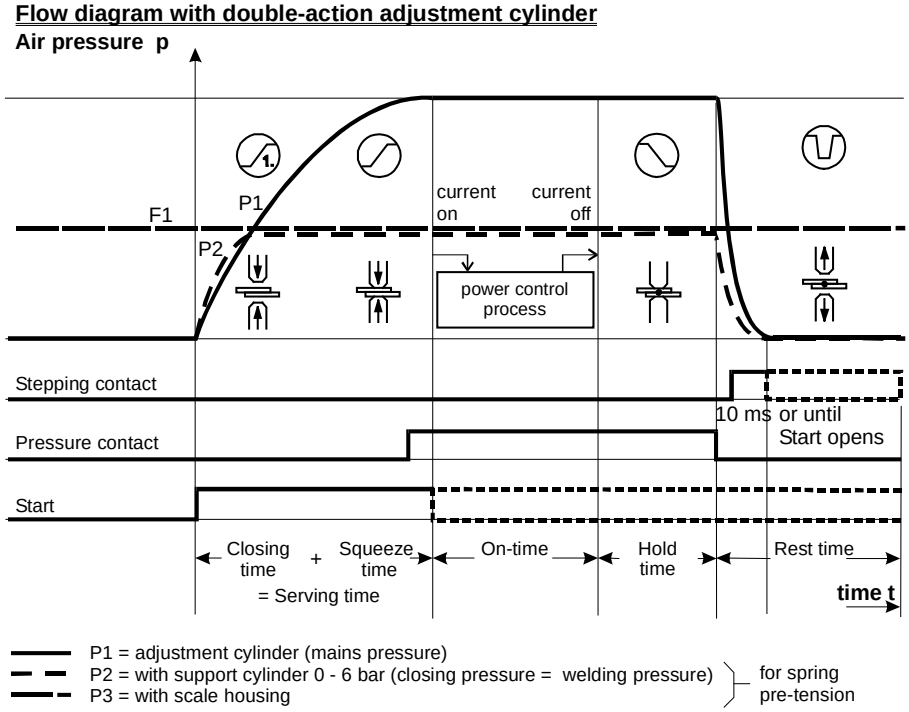
  The electrode now presses against the workpiece with the **spring force set** on the scale housing. The welding force generated by the selected setting can be read on a diagram or on the scale (see also diagram in appendix)
- **with support cylinder**

  The electrode now presses against the workpiece with the **spring force set** on the scale housing. Pressure pre-selected on the control is now applied to the support cylinder via a proportional valve. See the operating instructions for sequence and power control in this respect. The welding force generated by the selected setting can be read on a diagram or on the scale (see also diagram in appendix)
- The deflected anti-torsion protection suppresses the proximity switch (pressure switch DK) **and** welding is enabled after the adjustment time has expired
- The welding current is triggered and the set **weld program** (on time) is executed. A **transitional resistance** exists for the welding current on the weld material contact point. The high current density creates so much heat that the material is liquefied. The material is displaced by the **weld pressure** and the electrode makes contact (penetration). The rapid electrode follow-up during welding is extremely important during this. It is also important that the weld material remains uniform so that the transitional resistance prevailing when welding commences remains consistent and the set parameters deliver consistent results.
- Ensure that the proximity switch (DK) is continually suppressed **during electrode penetration**, as the welding current will otherwise be activated too early
- The hold time now commences. The electrodes remain on the weld material during this and the welding position cools down. The adjustment cylinder then opens the electrode(s)

Variant S, M	Variant Z	Variant H	Variant M
Option: The proximity switch / transducing sensor transmits the “**Head back**” signal	Mains pressure is applied to the locking cylinder when the sequence commences. This holds the pincers in a defined open position. The “**Pincers locked**” proximity switch is activated	The stroke cylinder then **moves back**. The return stroke speed can also be determined here by turning the exhaust throttle. The “**Welding head ahead**” proximity switch is deactivated. The “**Stroke cylinder back**” proximity switch is activated when the starting position is reached	

- The control then transmits the stepping contact (FK) signal and the weld material can be changed

4.1.1 Sequence Diagram with Weld Heads



Illus. 30: Sequence diagram with a four-time sequence control

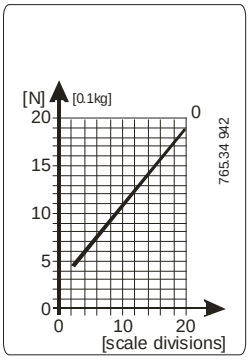
5 Appendix

5.1 Measuring Values Welding Pressure

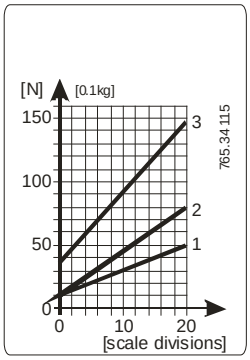
5.1.1 Welding Springs F120

Pressure spring		Force range	Order no. springs
0	green	1 – 15 N	765.18 866
1	blue	10 – 45 N	765.18 773
2	red	10 – 90 N	765.18 774
3	yellow	60 – 200 N	765.18 776

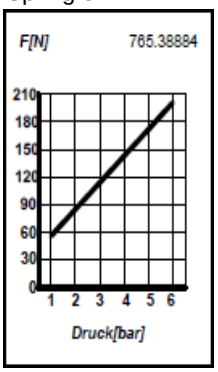
Spring 0



Spring 1-2



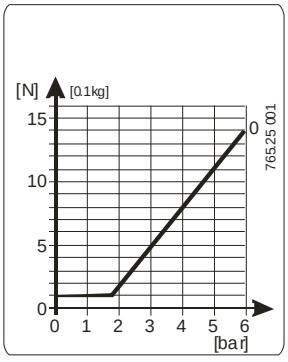
Spring 3



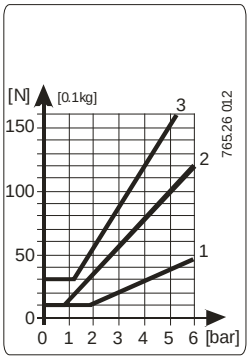
5.1.2 Support cylinder F120

Pressure spring		Force range	Order no. cylinder
0	green	1.2 – 15 N	765.34 465
1	blue	10 – 30 N	765.34 466
2	red	18 - 80 N	765.34 467
3	yellow	45 – 145 N	765.34 468

Spring 0



Spring 1-3



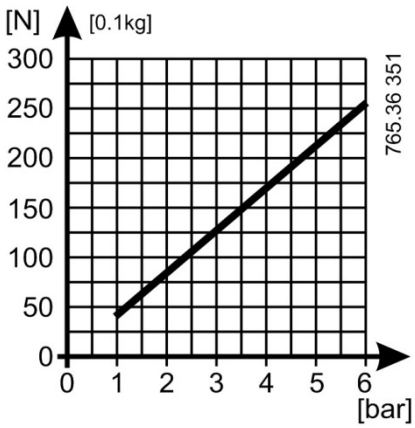
5.1.3 Welding Force Springs F160

Pressure spring		Force range	Order no. springs
1	green	50-110 N	765.34 339
2	blue	100-200 N	765.34 340
3	red	160-320 N	765.34 341
4	yellow	270-550 N	765.34 342

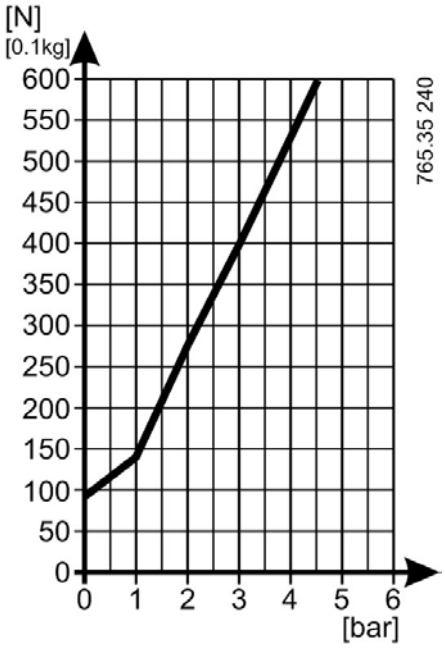
5.1.4 Support cylinder F160

Pressure spring		Force range	Order no. cylinder
2		50-240 N	765.35 235
4		150-550 N	765.35 227

Cylinder 240



Cylinder 550

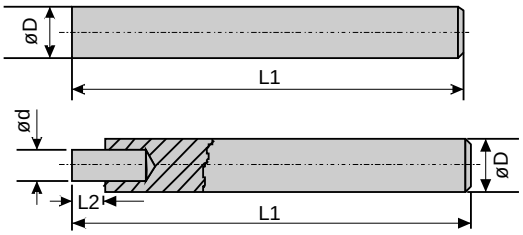


5.2 Accessories Electrodes

The right electrode selection influences quality of the weld joint and the uniformity in series production. Electrode's stability under heat is crucial concerning the costs for series production.

We offer a wide range of electrodes depending on the welding material:

Electrodes round, cylindrical



Cl.	Mat.	N	Insert	L1	L2	Part no.
		D [mm]	d [mm]	mm	mm	
0	E-Cu	3	-	40	-	765.90 777
0	E-Cu	6	-	50	-	765.91 116
0	E-Cu	10	-	75	-	765.90 678
2	CuCrZr	3	-	40	-	765. 83 458
2	CuCrZr	4	-	30	-	765.90 675
2	CuCrZr	4	-	75	-	765.90 745
2	CuCrZr	6	-	50	-	765.90 674
2	CuCrZr	10	-	75	-	765.90 677
3	CuCoBe	3	-	40	-	765.90 843
3	CuCoBe	6	-	50	-	765.90 673
3	CuCoBe	10	-	75	-	765.90 676
6	WCu	3	2	40	3	765.83 449
6	WCu	6	3	50	5	765.83 470
6	WCu	6	4	50	5	765.83 324
6	WCu	10	6	75	6	765.83 333
7	W	3	2	40	3	765.83 325
7	W	6	2	50	5	765.83 314
7	W	6	3	50	5	765.83 315
7	W	6	4	50	5	765.83 319
7	W	10	3	75	6	765.83 338
7	W	10	4	75	6	765.83 339
7	W	10	6	75	6	765.83 336
7.3	Wl20	6	2	50	5	765.21 154
7.3	Wl20	6	3	50	5	765.21 155
7.3	Wl20	6	4	50	5	765.21 156
7.3	Wl20	10	3	75	6	765.21 157
7.3	Wl20	10	4	75	6	765.21 158
7.3	Wl20	10	6	75	6	765.21 159
8	Mo	3	2	40	3	765.83 326
8	Mo	6	2	50	5	765.83 304
8	Mo	6	3	50	5	765.83 305
8	Mo	6	4	50	5	765.83 306
8	Mo	10	3	75	6	765.83 311
8	Mo	10	4	75	6	765.83 312
8	Mo	10	6	75	6	765.83 313
8.1	TZM	6	4	50	5	765.83 318
8.1	TZM	10	6	75	6	765.15 898
8.1	TZM	10	8	75	6	765.17 711

6 Index

6.1 Illustrations

6.2 Headword Index