Operating Manual

Tube to Tubesheet Weld Head
RBK 16

Version 07

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INDEX

1) GENERAL INFORMATION

The recent technological advances in the design and manufacturing processes of heat exchangers and equipment for chemical, nuclear and mechanical industry has forced the extensive use of new materials which require sophisticated and, therefore, highly precise and efficient welding systems.

These critical weld joints must be sound and safe because the smallest defect may have serious consequences.

The welding process commonly applied for welding tubes for heat-exchangers is TIG with filler metal, carried out with fully automatic equipment. This system allows the welding operation to be completely unaffected by the skill of the welder and produces perfectly repeatable high quality welds.

The model RBK 16 weld head has been specifically designed to meet these requirements. It automatically performs tube to tube sheet welds for tubes from 10 to 78 mm O.D.

1.1) Technical Specifications

Welding Process:	TIG and TIG + filler wire
Welding position:	horizontal, vertical, inclined
Positioning of weld head:	by means of a spring loaded balancer or positioning frame with x-y-z movement
Centering of torch:	by means of a series of spring loaded centering cartridges and mandrels
Torch cooling:	water cooled
Machine body cooling:	water cooled
Torch inclination:	max. +/- 45°
Welding diameters:	12 - 78 mm electrode parallel to tube axis 10 - 36 mm electrode inclined of 30° tube axis bigger and smaller diameters at request

Welding current (60% duty cycle):	max. 200 A DC pulsed max. 180 A DC linear
Rotation speed:	0,33 - 6,00 rpm (step less adjustment)
Front cage with steel ring:	standard
Adjustment of welding distance:	6 mm on torch support slider +/- 5 mm by means of adjustment ring (micrometric adjustment)
Filler wire group:	removable if not used
Filler wire speed:	0,15 - 1,50 m/min (step less adjustment)
Filler wire spool:	Midget of Sigmette 1 Kg
Wire diameter with rollers type 1:	0,6 - 0,9 mm
Wire diameter with rollers type 2:	0,9 - 1,2 mm
	If not specified the machine is delivered with rollers type 1

<u>Dimensions:</u>

- Machine body	100 mm diameter
- Spool protection cage	120 mm diameter
- Length:	
without wire group	350 mm
with wire group	480 mm
- Weight:	
without wire group	8,0 Kg
with wire group	10,0 Kg

2) DESCRIPTION OF THE WELD HEAD

A) The weld head can rotate indefinitely as current, cooling water and gas are brought to the torch by means of a special designed rotating coupling. In this way cable connections remain fixed

B) It is important to note that the machine body itself is water cooled, in order to guarantee a better protection in case of preheated tube plates

C) The wire spool rotates coaxially with the machine avoiding dangerous wire windings and torsions

D) Electrode and wire nozzle are both completely moveable towards the tube axis. In this way the electrode and the wire nozzle inclination can be easily optimised

E) All normal work operations and small maintenance jobs can easily be performed directly by the operator (replacement of spool, electrode, wire hose, etc.)

The weld head is composed of three groups:

- Central body and rotating coupling — assembly drawing 16.01.07.00
- Wire group — assembly drawing 16.02.02.00
- Front body and torch — assembly drawing 16.03.06.00

  assembly drawing 13.03.00.00

On request can be supplied:

- Three point support for welding of protruding tubes
- Enlarged weld head modification kit for welding tubes with diameter up to 100 mm (electrode parallel to tube axis)
- Internal bore welding torch (L= up to 400 mm), tube diameter 9,5 to 80 mm
- Front body with double sliders. One slide for the wire nozzle and one slide for the torch body. In this way electrode and wire nozzle can be adjusted separately
- Front dual flow cage for second gas (for titanium welding e.g.), at request with three point support
- Rear transparent anti-dust spool protection
- Vertical suspension kit

We would like to remind you that our staff is able to design special torches for special applications or welding geometries as well as prolonged torches for weldings in hardly accessible areas.

2.1) Main Body and Rotating Coupling

This group is composed of the following main items or subassemblies:

- Connection block to the main cable for cooling water, welding current and protection gas. To this block are connected two Viton hoses for the cooling water of the machine body
- Electric socket for connection to the welding programmer
- Rotation joint spindle and main distributor for cooling water, protection gas and welding current. The electrical contact between the parts is obtained by means of a lamellar joint
- Self lubrificating bearings for supporting the rotation joint spindle
- Rotation gear-motor (On request with tachometer feedback)
- Coupling between crown wheel-pinion for transmission of rotation from the gear-motor to the welding head
- Electro mechanic pulse-counter for controlling the welding cycle with respect to the torch position. The microswitch is actuated by a wheel with 20 cams which supplies 60 impulses during a 360° rotation of the torch
- External body with hook (Standard for welding in horizontal position)
- Contact flange for supplying current to the wire motor with carbon brushes
- Mandrel support vessel machined out of stainless steel
- Ball bearing which allows the rotation of the mandrel support vessel and the front part of the welding head
- Handle
- Ring for axial translation device to adjust distance electrode-work piece (+/- 5 mm)
- Start button (or emergency stop) for starting the welding cycle or act the emergency stop (if pushed during the cycle)

2.2) Connections

Together with weld head RBK 16 is supplied a connection cable L=8m which allows the connection to the welding programmer/power supply.

The cable contains the following tubes:

- cooling water to the torch
- gas 1
- gas 2 (eventually to be used for double gas)
- electrical cable

2.3) Filler Wire Group

- Filler wire gear-motor.
- Pair of wire feed rollers. On the machine are mounted usually rollers for wire 0,6 - 0,9 mm. On request can be supplied rollers for the wire 0,9 - 1,2 mm.
- Wire spool support: Standard spool is Sigmette or Midget (1 Kg).
- Elastic (spring loaded) blocking device which avoids by a clutch system the unrolling of the spool.
- Spool protection cage.
- Filler wire arrival group which can be moved towards x-y-z axis and is composed of:
  - guide nozzle
  - two hinges
  - insulating bushing
  - support shaft with insulating bushing

2.4) Front Body and Torch

- Brass slide body with sliding guide for the torch support. Inside the brass body is running the cooling water and the protection gas. Three Viton hoses start from here to the torch
- Torch body with two threaded holes for the gas diffuser (gas lens). The two holes correspond to the two possible positions of the electrode. The torch is covered by a special insulating painting in order to insulate the piece against high frequency
- Torch support with split for adjusting the welding distance. The support is insulated like the torch body. Attached to the support is the shaft for supporting the filler wire arrival group
- Radial torch position adjustment device (special screws)
- Insulating body
- Front cage with stainless steel support ring

2.5) Centering Feature for External Weldings

Is needed in order to maintain the welding gun perfectly in axis with the tube to be welded.

It consists of a spindle which is mounted by means of 5 screws on the support vessel.

On this mandrel are mounted the centering cartridges which will be located into the tube to be welded (bayonette attachment and blocked by a spring loaded ball).

The centering cartridge is equipped with four rows of spring loaded balls guaranteeing in this way a perfect centering of the welding head.

All mandrels and centering cartridges must be choosen with respect to the internal diameter of the tube to be welded.

Hereafter the list of all available standard centering cartridges and mandrels. Special types can be supplied on request.

Centering Device Type	Internal Tube Diameter min.	max.	Mandrel Type
	mm		
01	10	10.5	A
02	10.5	11	A
03	11	11.5	A
04	11.5	12	A
05	12	12.5	A
06	12.5	13	A
07	12.8	14	B
08	13.8	15	B
09	14.8	16	B
10	15.8	17	B
11	16.8	18	B
12	17.8	19	B
13	18.8	20.5	B
14	19.8	22.5	B
15	22.3	25	C
16	24.5	27	C
17	26.5	29	C
18	28.5	31	C
19	30.5	33	C
20	32.5	36	C
21	35.5	39	C
22	38.5	42	C
23	41.5	45	C
24	44.5	48	C
25	47.5	51	C
26	50.5	54	D
27	53.5	58	D
28	57.5	62	D
29	61.5	66	D
30	65.5	70	D
31	69.5	74	D
32	73.5	78	D
33	77.5	82	D

3) ACCESSORIES AND MODIFICATIONS

3.1) Internal Bore Welding Group

3.1.1) Internal Bore Welding without Filler Wire

A modification kit for the standard welding head can be supplied in order to perform internal bore weldings (TIG process) without filler wire for the following dimension:

- Length std < 400 mm
- Minimum tube diameter 9,5 mm

ORBITEC can supply even torches longer than 400 mm and corresponding to special welding geometries.

The standard torches cover the diameter range from 9,5 -80 mm.

Referring to the diameter the torches are subdivided into 5 groups:

- Group "A" : I.D. 9,5 - 13 mm
- Group "B" : I.D. 13,1 - 18 mm
- Group "C" : I.D. 18,1 - 30 mm
- Group "D" : I.D. 30,1 - 50 mm
- Group "E" : I.D. 50,1 - 80 mm

(On request even larger diameters)

Each group is composed of the following components:

- Water cooled torch with front centering bushings (ceramic), gas nozzle (ceramic), electrode holder with gas diffuser. Ceramic nozzle and electrode holder are fixed to the torch by means of a threaded bush. The electrode is fixed by a screw.
- Front cage with stainless steel centering bush to support the weld head on the tube plate.

It is possible to mount distance rings on the torch in order to reduce the length of the torch in case there are several welding depths with the same internal diameter.

These distance rings are available on request in all dimensions.

Variations of +/- 5 mm can be compensated by means of the adjustment-calibration ring which is mounted standard on the welding gun.

In any case we recommend to attach with the order for an internal bore welding torch the drawing of the welding geometry in order to fit out the torch the best way possible.

See drawing nr. 2 and drawing nr. 3

3.1.2) Internal Bore Welding with Filler Wire

Our R & D centre has developed internal bore welding torches with filler wire which fit into bores with I.D. of 25 mm. The special torches can be assembled on our welding head RBK 16.

For more details please contact our sales management.

See drawing nr. 4

3.2) Enlarged Welding Head for Tubes up to 100 mm

We supply a modification kit of the weld head in order to perform weldings of tubes with max. diameter of 100 mm (electrode parallel to tube axis), composed of:

- Adjustable front ring
- Torch support
- Viton hoses

See drawing nr. 5

3.3) Three Point Support

This is the ideal system when welding tubes protruding through the tube plate. It is assembled directly on the weld head instead of the standard front cage and it is composed of:

- Adjustable iron ring
- Fixing ring
- Columns and feet

See drawing nr. 5

3.4) Front Cage for Dual Gas Flow

For welding special material (e.g. titanium) it is necessary to obtain a completely inert environment. For this reason it is possible to fit on welding head RBK 16 a front cage with a transparent glass which allows to create an inert environment around the torch. This cage can be equipped with a three point support to render easier the positioning of the weld head on the tube plate.

The accessory is supplied complete with:

- Front cage with stainless steel front ring
- Pyrex glass
- Gas hose
- Nipple
- Upon request three point support

See drawing nr. 6

3.5) Spool Protection

This accessory is composed of two elements which contain hermetically sealed the filler wire group.

With this device can be performed weldings in particularly dusty or humid environments avoiding that the filler wire gets in contact with impurities which would have a negative result on the welding.

This kit is composed of:

- Protection bush
- Transparent cap

See drawing nr. 6

3.6) Vertical Suspension

In case the machine is used in vertical position the welding head can be hooked up by means of this device.

The kit is composed of two brackets and an eyebolt and is mounted on the rear spool protection cage.

3.7) Front Head with Double Slider

It is possible to equip the welding head with a second slide only for filler wire instead of having the wire shaft connected directly with the torch. In this way the wire can be adjusted separately from the torch adjustment. Both torch and wire nozzle can be moved vertically and horizontally. In this case the front body is composed as follows:

- Slide body (brass) with double with two sliding guides. One for the filler wire support and one for the torch support. From this slide body three Viton hoses for gas and water lead to the torch body

- Torch support slide with button hole for adjustment of welding distance. The support slide is covered by an insulating paint

- Torch body

- Wire slide group for adjustment of the wire nozzle with respect to the electrode

- Wire nozzle group

- Two radial adjustment screws for the radial position of the torch and the wire nozzle

*4) **SPARE PARTS LIST***

CENTRAL BODY *ASSEMBLY DRAWING:* ***16.01.07.00***

VALID FROM SERIAL NUMBER 9810359

POS.	DESCRIPTION	P/N
01	BUSHING	16.01.00.01
03	CONICAL WHEEL	16.01.01.03
04	PLATE	16.01.00.04
05	INSULATING BODY	16.01.00.05
06	COLLECTOR FLANGE	16.01.04.01
07	COLLECTOR RING	16.01.00.07
08	INSULATING COLLECTOR RING	16.01.00.08
09	INSULATING COLLECTOR RING	16.01.00.09
10	DISC	16.01.00.10
11	SCREW PLUG	16.01.00.11
12	DOWEL	16.01.00.12
13	WATER CONNECTION BASE	16.01.00.13.00
14	WATER HOSE	16.01.04.02
15	WATER HOSE	16.01.04.03
16	MOTOR SUPPORT	16.01.07.01
17	PIGNON WITH TOPS COUNTER	16.01.01.02
18	ROTATION GEARMOTOR	16.01.07.02
20	SOCKET	16.01.07.03
21	GAS HOSE	16.01.00.21
22	CONNECTION PLUG	16.01.07.04.00
23	FUNNEL RING	16.01.04.06.00
24	BLOCK	16.01.04.11
25	INSULATING FLANGE	16.01.00.25
26	BRUSH HOLDER BLOCK	16.01.00.26
27	COVER	16.01.00.27
28	BLEEDING HOSE	16.01.04.07
29	THREATED PLUG	16.01.00.29
32	BUSH	04.04.00.02.02
33	PLUG	04.04.00.03
34	SPRING FOR BRUSHES	04.04.00.14
35	NUT	04.04.00.20
36	NUT	04.04.00.21
37	GUIDE FOR SPRING	04.04.00.26
38	BRUSH	04.04.00.31
39	CONNECTING RING	04.04.00.59
40	WRENCH NUT	06.06.00.02
41	SPRING	10.01.00.41.00
42	PROTECTION FOR PUSH BUTTON	10.01.00.70
43	SLIDING RING	13.01.00.01
44	SEALING BUSH	16.01.04.08
45	TONGUE	13.01.00.04
47	SPACER	13.01.00.07
48	INSULATING BUSH	13.01.00.08.00
49	SUPPORT	13.01.00.10

50	GASKET	13.01.00.11
51	DISTRIBUTOR SPINDLE	13.01.00.16

CENTRAL BODY *ASSEMBLY DRAWING:* ***16.01.07.00***

VALID FROM SERIAL NUMBER 9810359

POS.	DESCRIPTION	P/N
52	DISTRIBUTOR	13.01.00.17
53	BEARING	13.01.00.24
54	SPINDLE SUPPORT VESSEL	13.01.00.25.00
55	PROTECTION	13.01.00.26
56	RING	13.01.00.28
57	BEARING	13.01.00.29
58	PASTILLE	13.01.00.30
59	KNURLING KNOB	13.01.00.37
60	GAS CONNECTION	13.01.00.41
61	BASE	13.01.00.46
62	SIDE PLATE	13.01.00.47
63	PLATE	13.01.00.49
64	BRUSH HOLDER	13.01.01.07
65	CLAMP BLOCK	33.01.00.30
66	CABLE CLAMP	33.01.00.31
67	INSULATING SHELL	89.01.00.38
72	CLAMPING RING	53.20.11.25.15
73	BALL BEARING	55.19.55.32.13
75	SEEGER RING	53.01.15.22.29
78	O-RING	56.40.00.40.31
79	O-RING	56.40.00.40.32
80	O-RING	56.40.01.40.02
82	LAMELLAR COUPLING	68.60.00.39.03
84	MALE PIN	86.73.03.39.84
87	O-RING	56.40.00.40.02
93	START/STOP BUTTON	63.62.00.39.01
95	MICROSWITCH	62.25.01.39.02
97	ROTATION GEARMOTOR WITH TACHO	16.01.07.05
98	MACHINE CABLE	15.01.01.18.00
99	COMPLETE CONNECTING BLOCK	16.01.00.34.00
A1	INSULATING HOSE	16.01.00.35
A2	INSULATING HOSE	16.01.00.36
A4	CENTERING RING	16.01.04.09
A6	PROTECTION REAR BLOCK	16.01.02.06
A7	PROTECTION FRONT BLOCK	16.01.02.07
B1	PLATE	16.01.04.10
B6	WASHER	16.01.07.06
B7	PLATE	16.01.04.13

FILLER WIRE GROUP *ASSEMBLY DRAWING:* ***16.02.02.00***

VALID FROM SERIAL NUMBER 99901367

POS.	DESCRIPTION	P/N
01	FRONT WIRE HOSE	16.02.00.01
02	WASHER	16.02.00.02
03	BEARING SUPPORT BELL	16.02.00.03
04	SPACER	16.02.00.04
06	BUSH	16.02.00.06
07	CAGE	16.02.00.07
08	SPOOL SUPPORT	16.02.00.08
09	BUSH FOR BEARING	16.02.00.09
10	FLANGE	16.02.00.10
11	STIRRUP	16.02.00.11
12	GEARED SPINDLE	16.02.00.12
13	GEARMOTOR SUPPORT	16.02.02.01
14	FILLER WIRE GEARMOTOR	16.02.00.14
15	WASHER	16.02.00.15
16	STIRRUP	16.02.00.16
17	REAR WIRE INLET	03.04.00.29
18	DOWEL	04.05.00.01
19	BUSH	04.05.00.02
20	DOWEL	04.05.00.03
21	WIRE FEEDING WHEEL (0,6 - 0,8 mm)	04.05.00.04
22	WIRE FEEDING WHEEL (0,6 - 0,8 mm)	04.05.00.05
23	FEMALE THREAD BOLT	04.05.00.06
24	SPACING WASHER	04.05.00.07
25	BOLT	04.05.00.08
26	WIRE FEEDING WHEEL (0,9 - 1,2 mm)	04.05.00.09
27	WIRE FEEDING WHEEL (0,9 - 1,2 mm)	04.05.00.10
28	STIRRUP	04.05.00.11
29	WIRE PUSH ASSY BODY	04.05.00.12
30	INSULATING BUSH	04.05.00.13
31	WIRE SHAFT WITH INSULATING BUSHING	04.05.00.14
---	INSULATING BUSHING	04.05.00.14.02
---	SHAFT	04.05.00.14.01
32	SHAFT SUPPORT	04.05.00.15
33	WIRE NOZZLE SUPPORT	04.05.00.16
34	SPOOL SHAFT	04.05.00.17
35	GEAR	04.05.00.20
36	MOTOR PIGNON	04.05.00.21.00
37	REAR WIRE HOSE	15.01.00.21
38	KNOB	04.05.00.27
39	NUT	04.05.00.28
40	SPRING	04.05.00.29
41	WASHER	04.05.00.30
42	CLUTCH DISC	04.05.00.31
43	CLUTCH	04.05.00.32
44	BUSH	04.05.00.33
45	WIRE EXIT NOZZLE	04.05.00.34

46	WIRE ENTRY NOZZLE	04.05.00.35
47	WIRE NOZZLE	04.05.00.36
48	BUSH	06.04.00.10

FILLER WIRE GROUP *ASSEMBLY DRAWING:* ***16.02.02.00***

VALID FROM SERIAL NUMBER 9901367

POS.	DESCRIPTION	P/N
52	SEEGER RING	53.01.15.22.31
54	BALL BEARING	55.19.55.32.13
63	BALL BEARING	55.19.55.32.69
64	BALL BEARING	55.19.55.32.55
68	BALL BEARING	55.19.55.32.63
69	ROLLER CAGE	55.49.55.61.02
73	MALE PIN	86.73.01.39.84
74	FEMALE PIN	86.73.01.39.85
99	WIRE THRUST GROUP COMPLETE	23.01.00.99

FRONT BODY AND TORCH *ASSEMBLY DRAWING:* ***16.03.06.00***
(WITH DOUBLE SLIDE AND RACK)

VALID FROM SERIAL NUMBER 200110477

POS.	DESCRIPTION	P/N
01	FILLER WIRE NOZZLE	16.03.06.01
02	RACK SUPPORT	16.03.06.02
03	SLIDE	16.03.06.03
04	PROTECTION	16.03.06.04
05	ROD COMPLETE	16.03.06.05.00
06	RACK	16.03.06.06
07	FILLER WIRE SUPPORT	16.03.03.02
08	SHAFT	16.03.03.03
09	INSULATING PROTECTION	16.03.03.04

FRONT BODY AND TORCH *ASSEMBLY DRAWING:* ***13.03.00.00***

VALID FROM SERIAL NUMBER 9508205

POS.	DESCRIPTION	P/N
01	SLIDE FOR TORCH SUPPORT	13.03.00.01
02	INSULATING BODY	13.03.00.02
03	SLIDE FOR RADIAL ADJUSTMENT	13.03.00.03
04	SLIDE BODY	13.03.00.04
05	SPECIAL SCREW	13.03.00.05
06	INSULATING PLATE	13.03.00.06
07	PLATE	13.03.00.07
08	SLIDE TORCH ADJUSTMENT	13.03.00.08
09	SLIDE RADIAL ADJUSTMENT	13.03.00.09
10	TORCH BODY	13.03.00.10
12	WATER RETURN HOSE	13.03.00.12
13	GAS HOSE	13.03.00.13
14	WATER IN HOSE	13.03.00.14
16	PLUG	03.06.00.34
17	RING	04.06.00.07
18	FRONT CAGE	04.06.00.08
19	INSULATING BUSHING	04.06.00.09
20	GAS LENS	04.06.00.10
21	TORCH GASKET	04.06.00.15
22	ADJUSTMENT SCREW	04.06.00.17
23	ADJUSTMENT SCREW	04.06.00.18
24	NUT	06.06.00.02
28	O-RING	56.40.00.40.02
31	ELECTRODE HOLDER	64.20.02.39.11
32	CERAMIC NOZZLE FOR GAS LENS	64.20.03.39.10

5) GENERAL SAFETY RULES

These rules apply to AC and DC welding generators, AC transformers, AC/DC welding machines and DC transformer welding rectifiers.

In arc welding operations, where electrically charged parts are exposed, the following rules should be observed to assure maximum safety and protection to operator and surroundings.

Failure to observe these safety precautions may expose, not only the operator himself, but also fellow workers, to serious injuries. Once these rule are studied and well kept in mind, proceed, in any case with maximum care.

Welding Cables: DO NOT overload cables.

DO NOT use welding cables at excessive current rates compared to their capacity. It will cause overheating and rapid deterioration of their insulation. It is certainly uneconomical.

DO NOT use worn-out or poorly connected cables.

INSPECT cables frequently. Repair immediately all breaks in insulation with rubber and friction tapes. Tighten and adequately insulate all cable connections. It is dangerous when exposed sections of cable come in contact with grounded metallic objects causing an arc. Unprotected eyes may be injured and fire may result if combustible materials such as oil or grease are in the vicinity.

Binding Code: Welding machines must be installed and maintained in accordance with the local National Electric Code.

Polarity Switch: DO NOT operate the polarity switch under load.

The polarity switch, when supplied, is provided for changing the electrode lead mutually from positive to negative. Operate this switch only while the machine is not in use and the welding circuit is open. Potential dangers of opening the circuit while charged with current are the following:

- An arc could form between contact surfaces of the switch

- The person using the switch may receive a severe burn from this arc

Ground Power Circuit: DO NOT use welding machine without grounding frame of case.

GROUND every power circuit to prevent accidental shock by stray current.

DO NOT ground to pipelines carrying gas or inflammable liquids and lines carrying electrical conductors.

BE SURE that conductors can safely carry the ground current.

Welding Operations: NEVER weld pieces without cleaning or inert materials which, when heated, give off inflammable or toxic vapours.

USE steam to clean superficial material.

USE a strong cleaning solution to clean out heavy oils or grease.

BE SURE to remove any residues of inflammable gas or liquid.

NEVER use oxygen to ventilate the welding piece.

CAUTION when cleaning with steam or caustic soda.

WEAR goggles and gloves.

DO NOT clean where there is poor ventilation.

Ventilation is necessary to divert harmful or explosive vapours.

DO NOT clean in the presence of open flames of arc.

USE a wet tool to avoid sparks, when scaring or hammering to remove heavy sludge or scale.

KEEP head and arms distant from work as possible.

Explosion Hazards: NEVER weld in or near explosive atmospheres.
Such atmospheres ca be created by inflammable gas leaks or by vapours from inflammable liquids or by combustible dusts.

Ventilation: DO NOT weld in enclosed spaces without adequate ventilation.

When welding in enclosed spaces always provide adequate ventilation with fans, air pipes, etc.

NEVER use compressed oxygen.

Heat and fumes from welding could cause sever discomfort or serious illnesses.

When toxic fumes from lead or cadmium content materials or any other substances are present in proportions that could be harmful always use a gas mask.

Solvents: DO NOT weld in the presence of even a small amount of vapour from solvents such as perchloroethylene or trichloroethylene.

Ultraviolet light from the electric arc can decompose the vapours forming phosgene, a poisonous gas.

Fire Hazards: DO NOT weld near inflammable or combustible materials.

Fire can be caused by the arc, on contact with heated metal, by slag or sparks.

KEEP combustibles at least 10 m from the arc, on the contrary they should be suitably protected by a flame-proof shield.

Dangers of Electric Shock: OPEN power circuits before checking machines.

DO NOT touch electrically heated parts.

NEVER touch any exposed or insulated part of the cables, cable connectors, electrodes, etc. to avoid harmful or fatal electric shock or burns.

NEVER work in a damp area without suitable insulation.

KEEP hands, feet and clothing dry at all times.

Salt in perspiration or sea water dangerously lowers contact resistances.

Face Protection: DO NOT use cracked or defective helmets or shields.

KEEP helmet and hand and face shield in good condition.

If cracks occur in fibre material, replace shield, since leakage of arc rays may cause serious burns.

Eye Protection: DO NOT under any circumstances, view an electric arc without eye protection.

MAKE sure that flash goggles are used under the welding helmet at all times.

In some types of arc welding, such as TIG welding, ultra-violet and infrared radiation from the arc is particularly intense and requires constant attention to avoid arc flashes reaching welder or other exposed persons.

NEVER use cracked, ill-fitting or defective filter plates.

Eye burns from the arc, though not generally permanent injuries, are exceedingly painful.

Such burns, frequently referred to as flashes, fell like hot sand in the eye.

For eye burns, consult your first aid station or doctor.

Clothing: DO NOT use inadequate or worn-out clothing.

Proper and dry, oil-free clothing is essential for welders protection.

Clothing must not only keep off sparks and molten particles, but must also obstruct the rays from the arc.

They must insulate the body from harmful electric currents.

Wear leather or asbestos gloves at all times to protect hand and wrists.

Dark coloured shirts are preferred to light ones since arc rays readily penetrate light-coloured fabrics.

In case of gas-shielded arc welding, light colours are more reflective and may cause eye burns due to intense ultra-violet rays given off by the process.

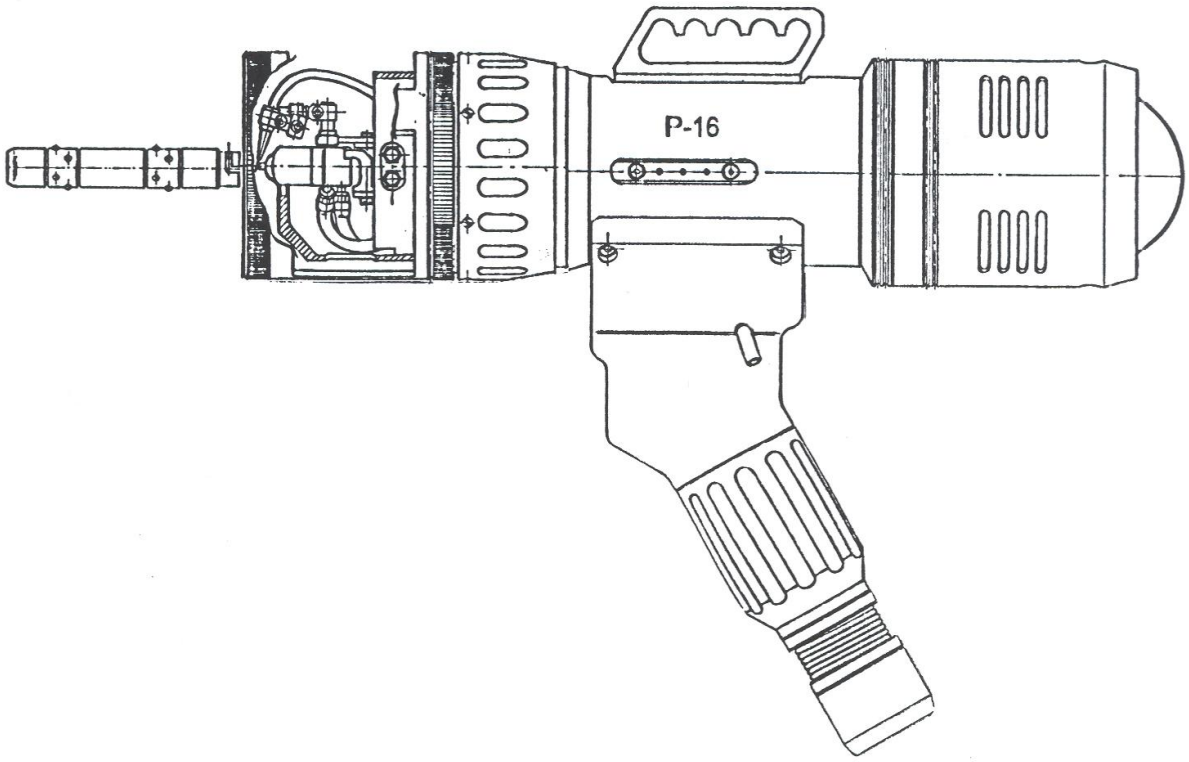
Avoid cotton fabrics with gas shielded arc welding.

Hot Metals Burns: DO NOT touch hot metals.

DO NOT touch pieces of metal which have just been welded or heated.

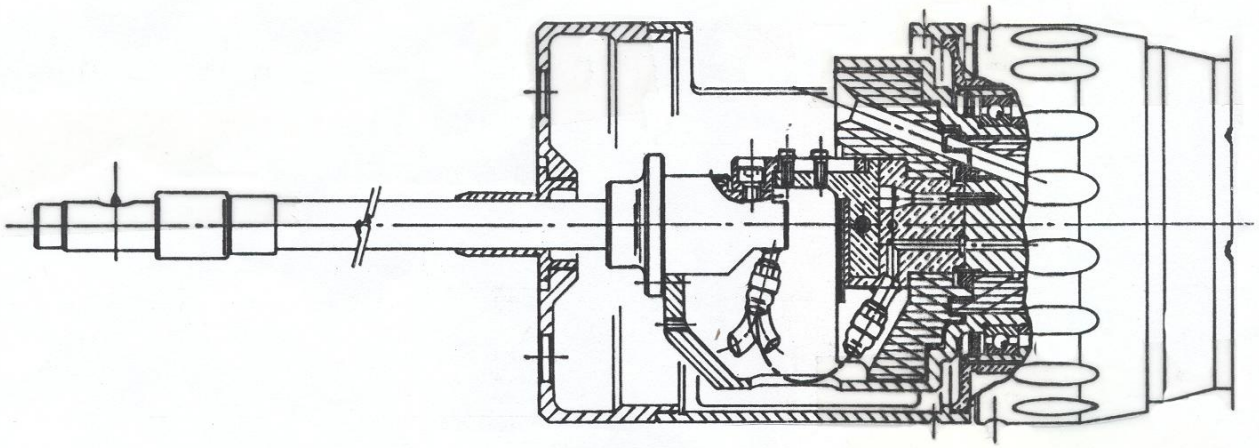
DO NOT substitute electrodes or centering cartridges immediately after welding.

RBK 16

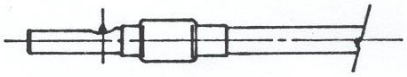


Drawing nr. 1

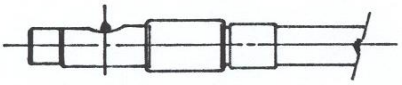
RBK 16



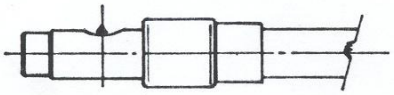
TORCH FOR INTERNAL TUBE DIAMETER



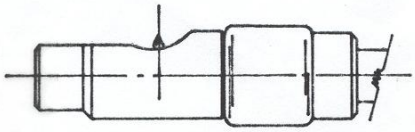
9,5 - 13 mm



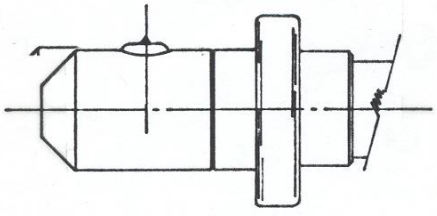
13,1 - 18 mm



18,1 - 30 mm



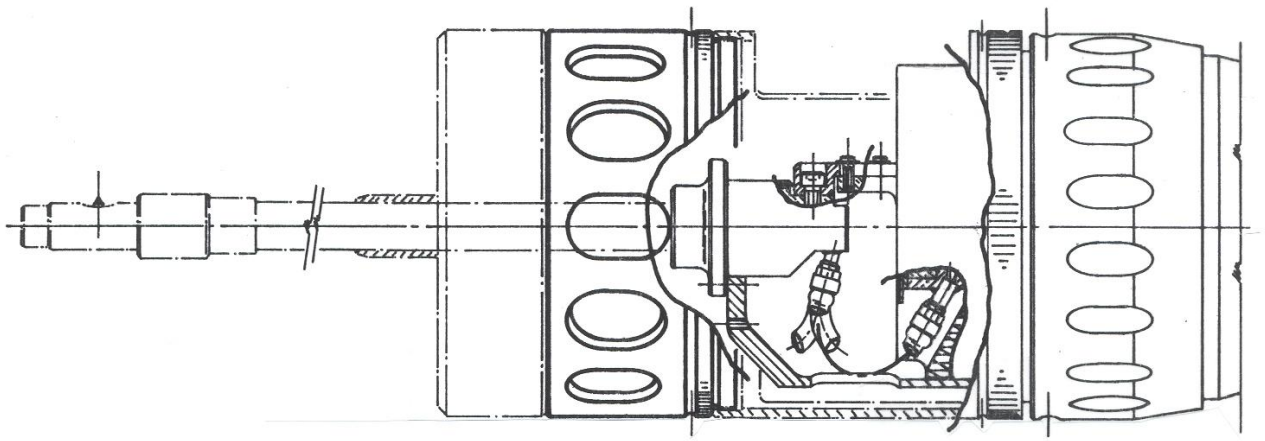
30,1 - 50 mm



50,1 - 80 mm

Drawing nr. 2

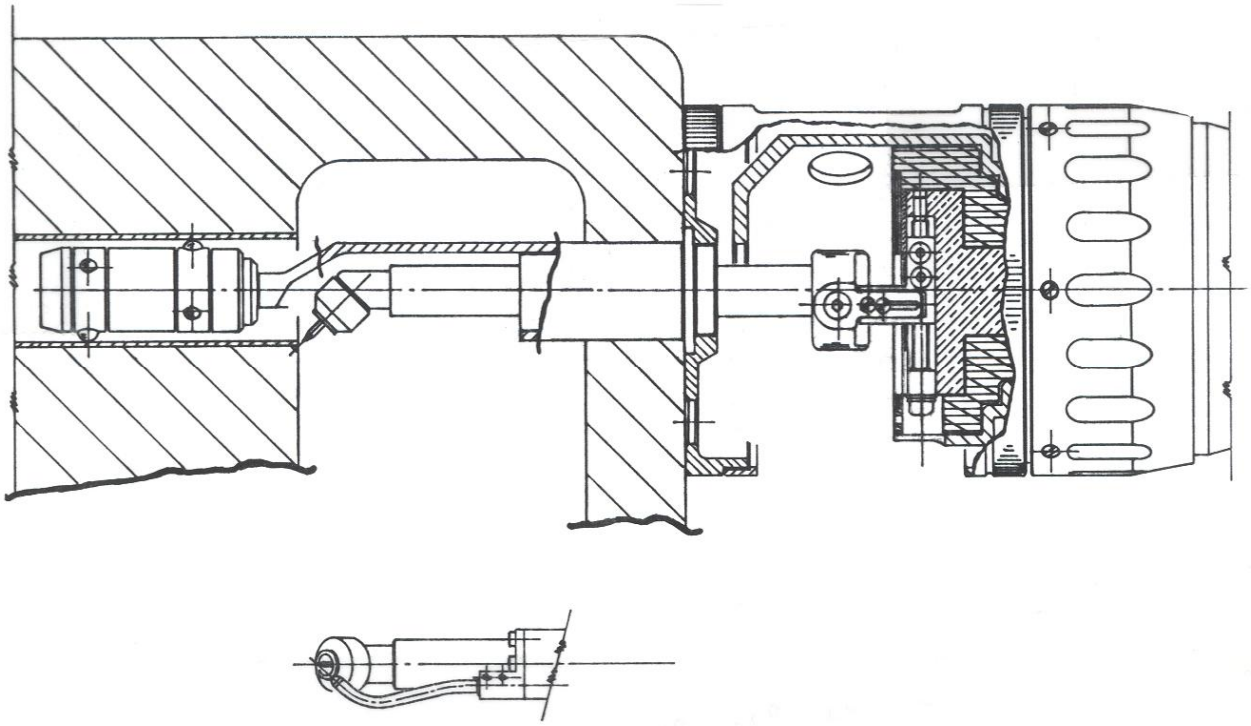
RBK 16



REDUCTION RING FOR WELDING DEPTH

Drawing nr. 3

RBK 16



TORCH WITH FILLER WIRE

- min. tube Diameter 25,4 mm

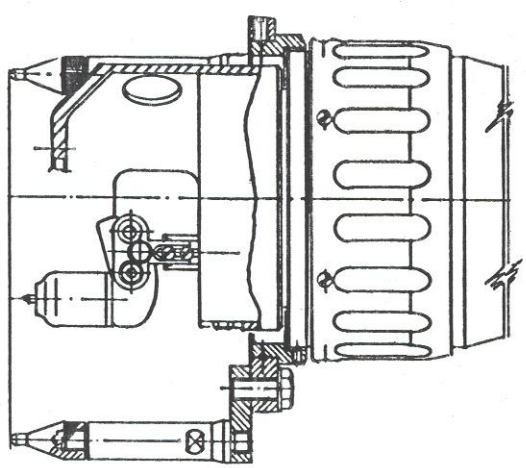
- min. plate Bore 26 mm

- filler wire Diameter 0,6 -0,8 mm

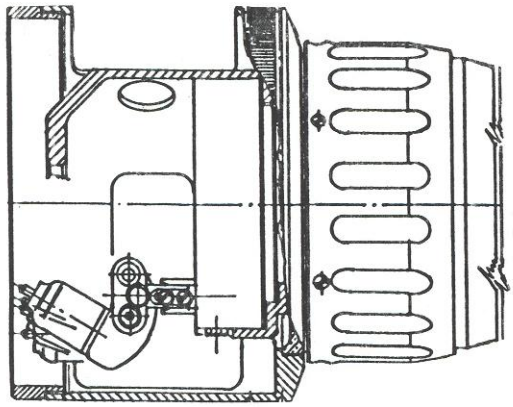
- length at request

Drawing nr. 4

RBK 16



THREE POINT SUPPORT

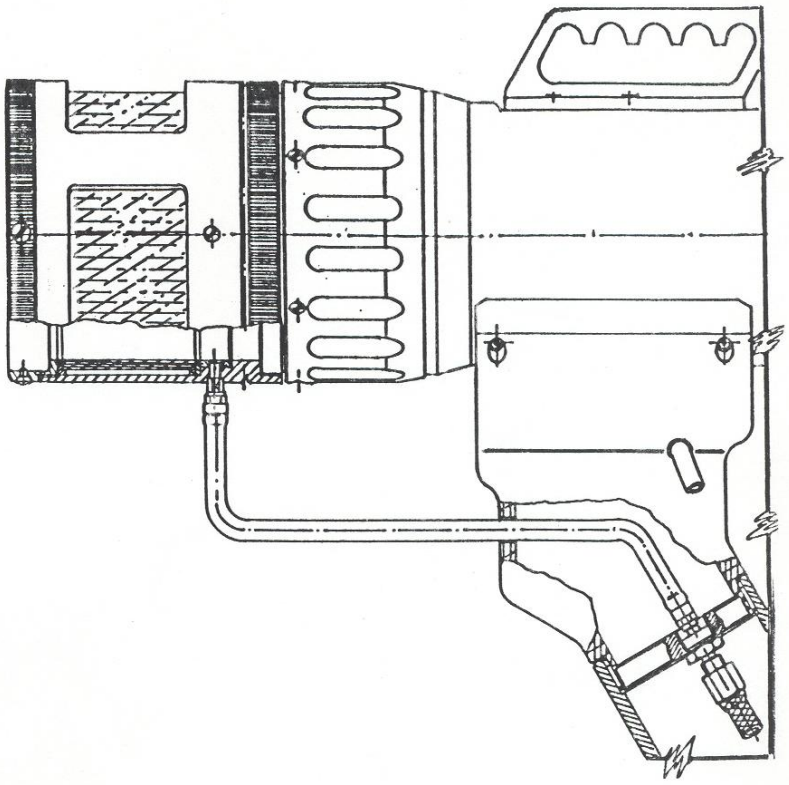


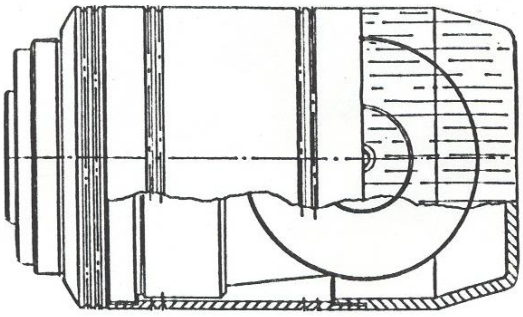
ENLARGED HEAD FOR TUBES > 78 mm

Drawing nr. 5

RBK 16

DOUBLE GAS CHAMBER





TRANSPARENT SPOOL PROTECTION

Drawing nr. 6