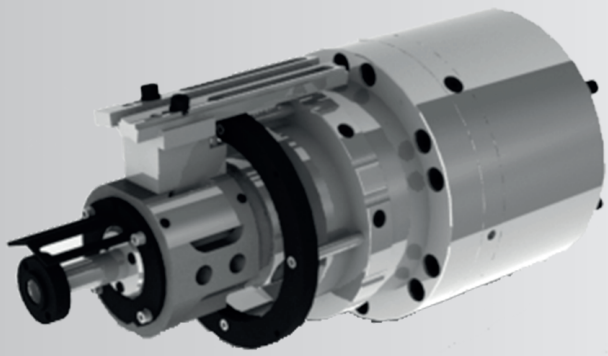
World class
clamping solutions

Installation, use and maintenance manual



HYDRAULIC DOUBLE PISTON CYLINDER

DCN
DCR
DCU
DCE

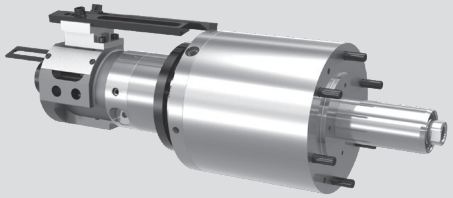
AUTOBLOK 10705149 - rev.07/2025 edited by MRK.DPT.

EN

DCN/DCU/DCR

Rotating hydraulic cylinder with 2 independent pistons

- **Modular system for different piston strokes**
- **Up to 70 bar**
- **Central bore for air / coolant / oil**
- **Stroke control via proximity switch or LPS 4.0**



Application/customer benefits

- Actuation of retractable jaw chuck with power operated face drivers
- Actuation of power chuck with part-ejector
- Actuation of power chucks with retractable axial stop / finger chucks with power operated centering fixture / chucks typ TPT-C with 2 piston actuation

Technical features

- Double piston cylinder with 4 way oil manifold for separate actuation of the 2 cylinders
- Pressure range 8 - 70 bar
- Modular system for different piston strokes: DCN, DCU and DCR
- Horizontal or vertical installation
- Stroke control on each cylinder, safety valves on the big cylinder
- Central bore for coolant, oil or air with thread for rotary union
- Mounting from the rear side with bolts
- A 10 µm filter in pressure line is requested
- Use oil HM32 ISO 3448

Standard equipment

Double piston cylinder with shift ring
Mounting screws
Stroke control on each cylinder
Proximity bracket (without proximity switches)

Ordering example

Double piston cylinder DCN 125-30
or
Double piston cylinder DCN 125-30
with rotary union (optional)

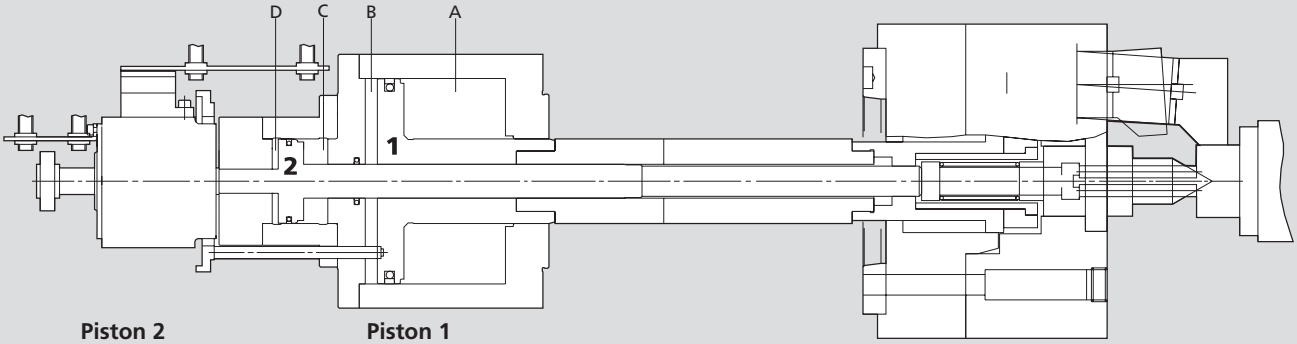
Technical data

SMW-AUTOBLOK Type		60 / 20		125 / 30				170 / 40	170 / 60	170 / 40
		DCN 55-38	DCN 32-38	DCN 70-25	DCN 87-40	DCU 40-40	DCR 40-80	DCN 95-50	DCU 50-48	DCR 50-95
Piston stroke	mm	55-38	32-38	70-25	87-40	40-40	40-80	95-50	50-48	50-95
Piston area A	cm^2	48	48	111	111	111	111	146	146	146
Piston area B	cm^2	60	60	125	125	125	125	168	168	168
Piston area C	cm^2	21	21	27	27	27	27	36	56	36
Piston area D	cm^2	21	21	30	30	30	30	40	60	40
A Piston force max.	kN	33.5	33.5	77	77	77	77	102	102	102
B Piston force max.	kN	42	42	87	87	87	87	118	118	118
C Piston force max.	kN	14.5	14.5	19	19	19	19	25	39	25
D Piston force max.	kN	14.5	14.5	21	21	21	21	28	42	28
Max. speed	r.p.m.	5000	5000	5000	5000	5000	5000	4000	4000	4000
Weight	kg	16.2	15.3	23.2	24	22.5	23	32	30	31
Moment of inertia	$kg \cdot m^2$	0.027	0.026	0.088	0.091	0.085	0.087	0.15	0.14	0.14
Operating pressure max.	bar	70	70	70	70	70	70	70	70	70
Operating pressure min.	bar	8	8	8	8	8	8	8	8	8
Oil leakage (*)	dm^3/min	3	3	3	3	3	3	3	3	3
ID.No.		**33705206**	**33705406**	**33705213**	**33705214**	**33705313**	**33705413**	**33705215**	**33705315**	**33705415**

* Total at 30 bar / 50 °C.

Important: On higher pressure the leakage increases proportionally. On higher oil temperature the leakage increases over proportionally (the use of an oil cooler is recommended). When designing / checking the hydraulic unit please ask for our data sheets.
Option: LPS 4.0 linear stroke control. Rotary union for oil / coolant / air.

Cylinder DCN for retractable jaw chucks type W or GSA with face drivers with fixed center



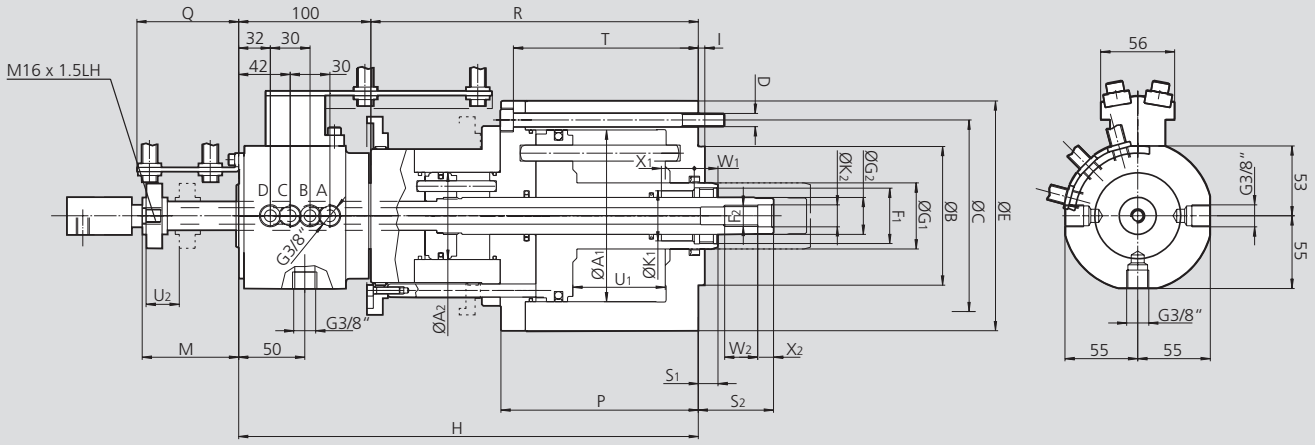
Piston 2
for actuation of the driving pins in the face driver

Piston 1
for chuck actuation

- Modular system for different piston strokes
- Up to 70 bar
- Central bore for air / coolant / oil
- Stroke control via proximity switch or LPS 4.0

DCN/DCU/DCR

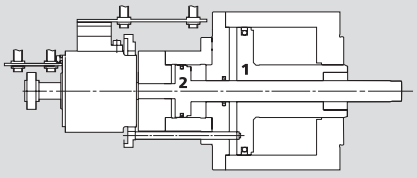
Rotating hydraulic cylinder with 2 independent pistons



Subject to technical changes.
For more detailed information please ask our customer service.

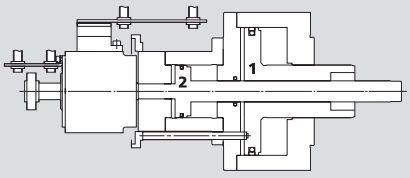
SMW-AUTOBLOK Type			60 / 20		125 / 30				170 / 40	170 / 60	170 / 40
			DCN 55-38	DCR 32-38	DCN 70-25	DCN 87-40	DCU 40-40	DCR 40-80	DCN 95-50	DCU 50-48	DCR 50-95
Piston diameter 1	**A1**	mm	90	90	130	130	130	130	150	150	150
Piston diameter 2	**A2**	mm	56	56	66	66	66	66	75	90	75
Centering rim	**B** h6	mm	80	80	105	105	105	105	120	120	120
Fixing bolt circle	**C**	mm	106	106	145	145	145	145	175	175	175
Fixing bolts	**D**	mm	6 x M8	6 x M8	6 x M10	6 x M10	6 x M10	6 x M10	6 x M12	6 x M12	6 x M12
	E	mm	125	125	174	174	174	174	204	204	204
Piston rod thread 1	**F1**	mm	M32 x 1.5	M32 x 1.5	M42 x 1.5	M42 x 1.5	M42 x 1.5	M42 x 1.5	M45 x 1.5	M45 x 1.5	M45 x 1.5
Piston rod thread 2	**F2**	mm	M16 x1.5	M16 x 1.5	M16	M16	M16	M16	M20	M20	M20
	G1	mm	45	45	50	50	50	50	60	60	60
	G2	mm	22	22	28	28	28	28	30	30	30
	H	mm	331	308	348	380	333	373	411	366	411
	I	mm	5	5	5	5	5	5	5	5	5
	K1	mm	32.5	32.5	38	38	38	38	42	42	42
	K2	mm	16.5	16.5	16.5	16.5	16.5	16.5	22	22	22
Max.	**M**	mm	67	67	73	73	73	103	73	73	118
	P	mm	198	175	150	167	120	120	184	139	139
	Q	mm	77	77	77	77	77	107	77	77	122
	R	mm	231	208	248	280	233	273	306	266	311
Min.	**S1**	mm	8	8	15	15	45	45	15	60	60
Min.	**S2**	mm	35	12	57	75	72	82	73	118	73
	T	mm	-	-	140	157	110	110	172	127	127
Piston stroke cyl. 1	**U1**	mm	55	32	70	87	40	40	95	50	50
Piston stroke cyl. 2	**U2**	mm	38	38	25	40	40	80	50	48	95
	W1	mm	30	30	18	18	18	18	42	42	42
	W2	mm	25	25	25	25	25	25	25	25	25
	X1	mm	-	-	25	25	25	25	10	10	10
	X2	mm	7	7	12	12	12	12	12	12	12

DCN



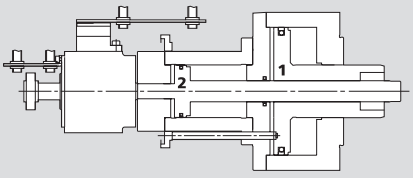
Piston 1: long stroke
Piston 2: short stroke

DCU



Piston 1: mid. stroke
Piston 2: mid. stroke

DCR



Piston 1: short stroke
Piston 2: long stroke

DCE

Equal piston area and stroke
2 independent pistons

- **Double piston rotating hydraulic cylinder**
- **Up to 70 bar**
- **Central bore for air / coolant / oil**
- **Stroke control via proximity switch or LPS 4.0**

Application/customer benefits

- Actuation of 2 + 2 power chucks type TPT with 2 piston actuation
- Actuation of power chuck with part ejector
- Actuation of power chucks with retractable axial stop / finger chucks with power operated centering fixture

Technical features

- Double piston cylinder with 4 way oil manifold for separate actuation of the 2 cylinders
- Pressure range 8 - 70 bar
- Horizontal or vertical installation
- Safety valves on the biggest cylinders and stroke control on each cylinder (piston 1)
- Central bore for air, coolant or oil with thread for rotary union
- Mounting from the rear side with bolts
- A 10 µm filter in pressure line is requested
- Use oil HM32 ISO 3448

Standard equipment

Double piston cylinder with switch ring
Mounting screws
Stroke control on each cylinder
Proximity bracket (without proximity switches)

Ordering example

Double piston cylinder DCE 64-64
or
Double piston cylinder DCE 64-64
with rotary union (optional)

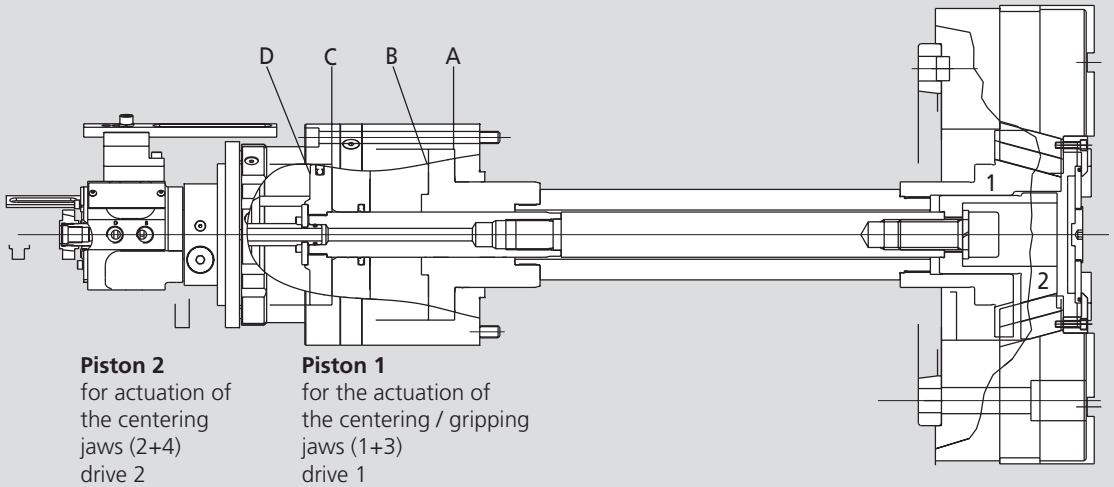
Technical data

SMW-AUTOBLOK Type		DCE 64-64 / 30-40	DCE 140-140 / 50-50	DCE 240-240 / 60-60
Piston stroke	mm	30-40	50-50	60-60
A Piston area	cm²	66	140	238
B Piston area	cm²	63	211	340
C Piston area	cm²	63	138	238
D Piston area	cm²	66	150	254
A Piston force max.	kN	46	98	119
B Piston force max.	kN	44	147	170
C Piston force max.	kN	44	97	119
D Piston force max.	kN	46	105	127
Max. speed	r.p.m.	5000	4000	3200
Weight	kg	28.6	42.5	116
Moment of inertia	kg·m²	0.074	0.18	1
Operating pressure max.	bar	70	70	50
Operating pressure min.	bar	8	8	8
Oil leakage (*)	dm³/min	3	3	3
ID.No.		**33705212**	**33705217**	**33705221**

* Total at 30 bar / 50 °C.

Important: On higher pressure the leakage increases proportionally. On higher oil temperature the leakage increases over proportionally (the use of an oil cooler is recommended).
When designing / checking the hydraulic unit please ask for our data sheets.

Cylinder DCE for 2 + 2 chucks type TPT



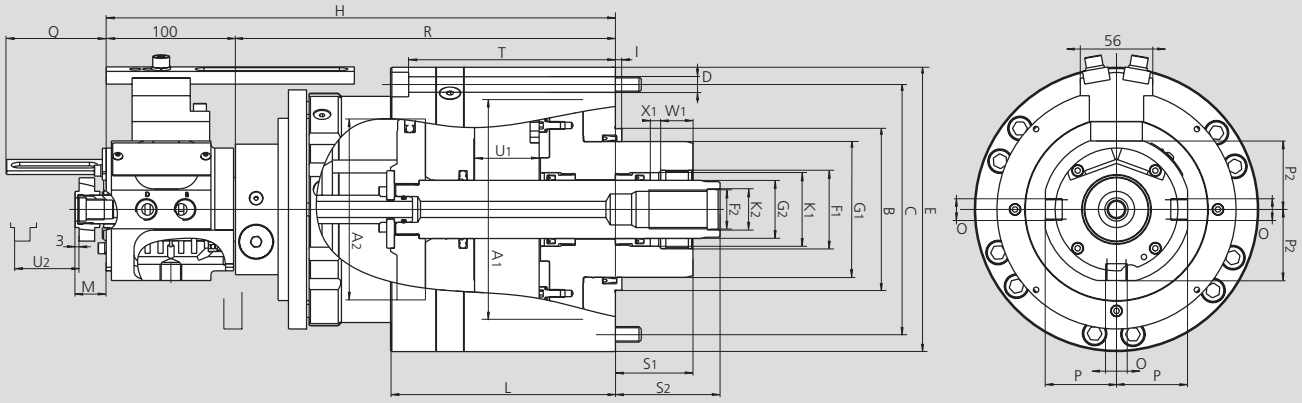
Piston 2
for actuation of the centering jaws (2+4) drive 2

Piston 1
for the actuation of the centering / gripping jaws (1+3) drive 1

- Double piston rotating hydraulic cylinder
- Up to 70 bar
- Central bore for air / coolant / oil
- Stroke control via proximity switch or LPS 4.0

DCE

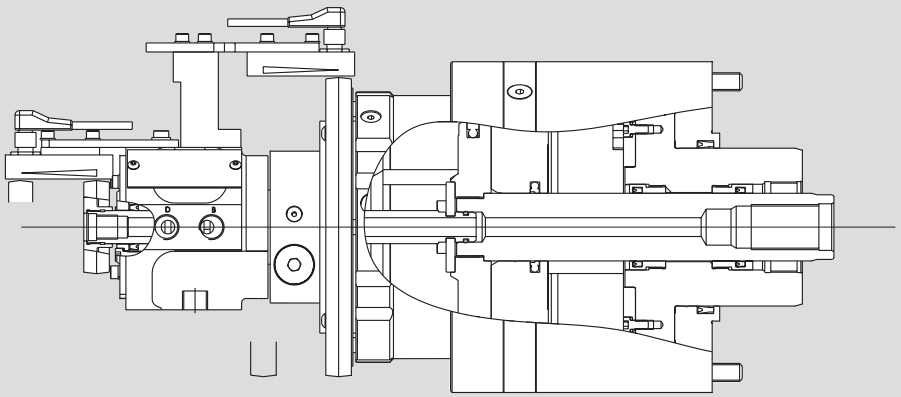
Equal piston area and stroke
2 independent pistons



Subject to technical changes.
For more detailed information please ask our customer service.

SMW-AUTOBLOK Type			DCE 64-64 / 30-40	DCE 140-140 / 50-50	DCE 240-240 / 60-60
Piston diameter 1	**A_1**	mm	125	170	215
Piston diameter 2	**A_2**	mm	95	140	183
Centering rim	**B** h6	mm	105	125	160
Fixing bolt circle	**C**	mm	145	195	250
Fixing bolts	**D**	mm	6 x M10	6 x M12	6 x M16
	E	mm	174	220	280
Piston rod thread 1	**F_1**	mm	M45 x 1.5	M60 x 1.5	M75 x 2
Piston rod thread 2	**F_2**	mm	M20 x 1.5	M30	M36
	G_1	mm	85	105	125
	G_2	mm	30	45	55
	H	mm	362	394	451
	I	mm	5	5	5
	K_1	mm	42	57	70
	K_2	mm	20.5	31	37
	L	mm	164	174	213
Max.	**M**	mm	31	24	28
	O	inch	G 3/8″	G 3/8″	G 1/2″
	P	mm	55	55	62
	P_1	mm	55	55	63
	P_2	mm	53	53	63
	Q	mm	77	77	97
	R	mm	262	294	326
Min.	**S_1**	mm	40	60	70
Min.	**S_2**	mm	76	81	110
	T	mm	151	160	197
Piston stroke cyl. 1	**U_1**	mm	30	50	60
Piston stroke cyl. 2	**U_2**	mm	40	50	60
	W_1	mm	25	25	35
	W_2	mm	30	45	50
	X_1	mm	10	8	9
	X_2	mm	10	10	10

DCE cylinder with optional LPS 4.0 linear stroke control



GENERAL SAFETY INSTRUCTIONS

1. CORRECT USE

SMW-AUTOBLOK DC cylinders are designed for the clamping of workpieces on lathes/machine tools. Any other use can cause hazards. For any damages resulting herefrom SMW-AUTOBLOK is not responsible.

2. PERSONNEL

DC cylinders must be installed, operated and maintained only by qualified and regularly trained personnel.

3. PROTECTIONS

During machining the power chuck and the clamped component must be protected by safety guards. Open the machine door only when machine spindle is completely stopped. Maintenance and actuation of the power chuck must only be carried out when machine spindle is stopped.

4. MAX. SPEED

The max. spindle speed is engraved on the chuck body. It must not be exceeded. The max. spindle speed is only valid at max. draw-pull force Ftmax. using standard hard stepped jaws. If, for special applications, special top jaws are used, clamping force and the max. speed must be calculated according to EN1550 but not exceeding the max. permitted values. Heavy special top jaws have especially a big influence on the max. speed. During the machining operation the centrifugal force increases or decreases the gripping force:

- O.D. clamping = decreasing,
- I.D. clamping = increasing.

The calculated values should be measured with a dynamic gripmeter type GFT-X 4.0.

5. REMAINING RISKS

The type of components (shape, weight, unbalan- ce, material etc.) has a big influence on the system "machine tool - DC cylinder - component".

For that reason there is always a residual risk. These residual risks must be calculated by the user and have to be eliminated by suitable actions.

6. CLAMPING JAWS

Always use clamping Jaws according to SMW-AUTOBLOK's design, to work in safety condictions and avoid damages in the chuck. To fix the clamping Jaws use only screws class 12.9, hexagon socket head cap screws. For reference, the thread should be at least 1.25 x the pitch diameter.

Always tighten the screws with a torque wrench set according to the clamping couple shown in the "Use and Maintenance Manual". If the top Jaws have higher dimensions and greater mass than the specifications issued by SMW-AUTOBLOK, the clamping force reduce accordingly and become insecure.

7. MAINTENANCE

The DC cylinder must be maintained in regular intervals. It's necessary to periodically check the functioning of the safety valves. Every 2 years or 1.000.000 cycles, all seals of the cylin- der and the safety valves must be replaced. For these maintenances we suggest to use the SMW-Autoblok service centers. Replace damaged parts with original SMW-AUTOBLOK spare parts only. Maintenance must be carried out at safe spindle stop of the machine only.

8. OPERATING CYLINDER

NEVER provide a draw-pull higher than the rating for each chuck model. Excess draw-pull can cause breakage of internal parts of the chuck. If necessary reduce the draw-pull accordingly.

Always design connecting parts and adaptors that must work at preset draw-pull.

9. LOADING OF THE COMPONENT TO BE MACHINED

In case of manual loading of the component there is a risk for the operator to have his fingers crushed between the clamping jaws and the component. The correct behaviour to be held is shown in detail at paragraph 4.4.

10. ENVIRONMENT PROTECTION

Danger for environment when handling incorrect! Incorrect handling of environment hazardous materials, especially the disposal, may result in environmental damage. Always follow below instructions. In case environmentally hazardous material polluted the environment always take suitable actions immediately. If in doubt, inform the local authority about the pollution. The following hazardous materials are used: Lubricants such as oil and grease can contain poisonous agents. They must not pollute the environment. The disposal must be carried out by a suitable waste management company. For a proper function of the work holding, use original SMW-AUTOBLOK lubricant only.

11. WARRANTY

SMW-AUTOBLOK products are guaranteed for 12 months from shipment or 500.000 cycles, for use on eight-hour shifts against defects in material, processing, and assembly with the exception of parts subject to wear. The warranty does not apply in case of collision and/or accident or misuse and non-compliance with the instructions given in the operation and maintenance manuals. For applicability of warranty the product shall be returned in SMW-AUTOBLOK free of charges and without any freight costs.

12. COPYRIGHT

For any problems or questions please contact SMW-AUTOBLOK directly or one of our authorized offices.

ALL THE INDICATIONS LISTED TO THE PRECEDING POINTS MUST BE ABSOLUTELY RESPECTED. NEVERTHELESS, SINCE THEY ARE MANUFACTURED ON MACHINE TOOLS AND DESPITE THE ACCURATE MACHINING PRODUCED BY WARNING! SMW-AUTOBLOK, IT CAN REMAIN A RESIDUAL RISK THAT THE USER ALWAYS HAS TO BE ABLE TO FORESEE AND TO ELIMINATE.

Every product is supplied complete with the Declaration of Incorporation, as requested by the Norm 2006/42/CE of the European Parliament.

DCN-DCU-DCR-DCE - USE AND MAINTENANCE INSTRUCTIONS

LEGEND

☞ = Damag risk to the chuck and / or cylinder and / or machine

⚠ = Besides damage to the chucks and the machinery. RISK OF PHISICAL DAMAGE TO THE OPERATOR.

1. GENERAL

1.1 The hydraulic double piston cylinders DCN-DCU-DCR-DCE are the most advanced on the market as regards to speed, safety, and reliability; they have all the safety conditions required by the Berufsgenossenschaft and by international regulations.

1.2 SAFETY VALVE. The hydraulic double piston cylinders have two inbuilt non-return valves which can be inspected from the outside (4 for DCE 240-240). They maintain the pressure in the chambers even in the case of reduction or interruption in oil pressure. The minimum required pressure is 6 bar. These valves must be checked at least once every year and/or every 500.000 cycles (see point 6.2.D) and replaced if necessary.

1.3 PRESSURE RELIEF VALVES. In the bigger chamber of hydraulic double piston cylinders there are two maximum pressure valves rated at 85 bar, which opens automatically in case of overpressure (4 for DCE 240-240: 2 in the bigger chamber, 2 in the little chamber).

1.4 PISTON STROKE CONTROL. The two piston stroke control systems can be fitted on the rear and on the central side of the double piston cylinder, by means of proximity switches (not supplied).

1.5 VERY HIGH AXIAL TRAVEL SPEED OF THE PISTON. The hydraulic double piston cylinders, have a rotating manifold, with well dimensioned oil feed ports and a high pressure feed of up to 70 bar enabling the piston to make single strokes in about 1 sec: they are perfectly suited to mass production.

1.6 HIGH WORKING PRESSURE UP TO 70 BAR. Working at high pressure permits a high traction force, with reduced overall dimensions, weight and inertia of the cylinder. It is necessary to foresee in the hydraulic circuit suitable devices to eliminate eventual hydraulic hammerings (peaks of pressure).

1.7 MOUNTING WITH REAR SCREWS. The hydraulic double piston cylinders can be mounted by means of rear screws (drw.4), that allow in many applications mounting of the cylinder directly onto the pulley, therefore, much closer to the rear bearing of the spindle (also eliminating the need for an intermediate adaptor).

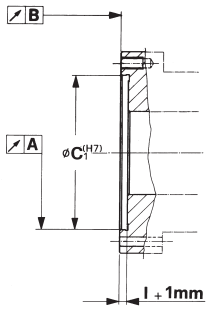
1.8 CENTRAL THRU-HOLE FOR COOLANT OR AIR. All hydraulic double piston cylinders have a central hole of 12.5mm for coolant or air to pass through and are designed to accept a DEUBLIN rotating unit mounted directly on the rear side of the piston rod.

1.9 The hydraulic double piston cylinder rotating cylinder is packed with great care prior to despatch and is therefore safe from any damage caused by ordinary loading, transport and unloading. The external metal parts are coated with suitable anticorrosion protection which must be removed before operating the cylinder. This is best done by a light brushing with kerosene/paraffin, followed by the cylinder being thoroughly dried.

2. FIXING OF THE ROTATING HYDRAULIC DOUBLE PISTON CYLINDER TO THE LATHE SPINDLE

2.1 ☞ In order to turn at high speed with minimum imbalance and vibration, the double piston cylinder must be as close as possible to the rear spindle adaptors and turn perfectly centered in comparison to the machine's rotational axis It is therefore necessary before mounting the cylinder, to check that the mating surface onto which the cylinder will bear, is running true to the following precision criteria.

drw. 1



Double piston cylinder	Size ≤ 175	Size ≥ 200
Concentricity	0,01	0,015
Flatness	0,005	0,010

2.2 HANDLING OF THE CYLINDE

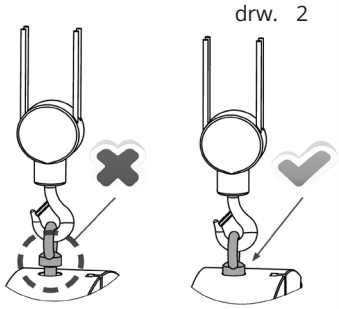
Important: the hydraulic double piston cylinder can be handled only by using the proper lifting device. According to the location the cylinder will have on the machine (horizontal or vertical) it will be necessary to use lifting chains, and or belts, and or eyebolts. (see drw.3).

⚠ ATTENTION: the operator must check that:

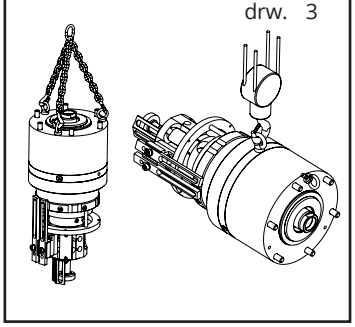
- The belts or lifting chains are strong enough to lift the load and are in perfect working conditions;

- The eyebolts are screwed to the bottom (see drw.2).

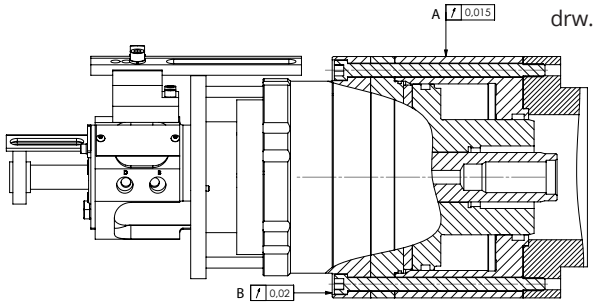
drw. 2



drw. 3



drw. 4



2.3 After the accuracy of the cylinder flange has been cheched, the cylinder must be mounted on it, using the rear mounting screw (drw.4). The mounting screws must be slightly tightened to center the cylinder on the rotation axis to the accuriaces requestes as shown on drw.4.

Then tighten the screws fully with the torque values in the following table:

SCREW NOMINAL SIZE	CLASS 12.9	
	F (KN)	M (Nm)
M8	16	23
M10	26	49
M12	38	77
M16	72	190
M20	110	370

2.4 The connection of the double piston cylinder to the chuck or other clamping equipment, is made of a draw-tube connected to the external piston rod and a draw-bar connected to the internal piston rod and guided into the draw-tube.

A) The draw-tube and the draw-bar are connected to the threads F1 and F2 of the double piston cylinder, for the dimensions see pages 4-6.

B) The draw-tube and the draw-bar have a centering diameter (concenric to the thread) that will pilot on the diameter K1 and K2 for a lenght of 10 mm and a locating face (square to the thread and the centering diameter) against the front faces of the piston rods (see page 4-6).

C) The draw bar must be supported along its length by at least two bushes, mounted on the bar to centralise in the machine spindle. This is essential when using the piston in thrust conditions, to avoid possible, bending of the draw bar, due to the "combined bending and compressive stress".

3. CYLINDER CONNECTION WITH THE DRAINING AND FEEDING HOSES

3.1 ⚠ All feeding and draining hoses must be flexible. Avoid using any rigid or semirigid tube which could exercise an axial pressure on the collector and damage the bearings.

3.2 ⚠ Only use connectors with parallel threads and suitable seal washer. NEVER USE CONNECTOS WITH TAPERED THREADS.

3.3 ☞ The oil manifold (the non rotating part of the hydraulic double piston cylinder) must be kept in position by using a bracket anchored on the machine. The bracket must not exert axial force and must have a 2-3mm radial clearance.

3.4 IMPORTANT: The oil seal between the fixed manifold and the rotating part of the cylinder is made by means of rotating rubber seals; this allows hydraulic double piston cylinders to be used for vertical applications. As the oil drain is not made by gravity, there must not be a difference in heght between the drain fitting and the oil level in the hydraulic power unit, but when so is possible is preferable, in order to guarantee to the cylinder better working temperatures.

4. HYDRALIC POWER UNIT AND RECOMMENDED OILS

4.1 The unit's tank capacity must be at least 4 times the nominal output of the pump measured in litres/min. (eg; with a 12 l/min pump the power unit tank must have a capacity of at least 45-50 litres). Should this be impossible, we recommend using oilcooling systems. The best operating temperature for hydraulic rotating cylinders is between 35° and 60° C (even 70° C will not cause any problem); it therefore advisable be structured the hydraulic unit to obtain these results also in the condition of use of the machine heavier. It is necessary to foresee in the hydraulic circuit suitable devices to eliminate eventual hydraulic hammerings (peaks of pressure).

4.2 The hydraulic system must have an aspiration filter with links of 50-60 µ and a 10 µ feeding filter (we suggest to use filter efficiency control systems). The delivery filter must be replaced every 6-8 months.

4.3 The hydraulic double piston cylinders have large oil feeding holes; in order to take advantage of this and achieve good piston speed, the pump of the hydraulic power unit must have adequate delivery capacity. The feeding circuit must have the shortest pipes possible, without constrictions and the electrovalves must have a large cross section for the oil flow.

4.4 RECOMMENDED OILS:

☞ The oil to be used with hydraulic rotating cylinders is specified in the ISO 3448 type HM 32 regulation. For example: SHELL - TELLUS 32 / AGIP OSO 32 – ESSO NUTO H32 (or TERESSO 32) / MOBIL DTE 24 (or DTE light).

⚠ **NOTE:** We do not recommend using higher density oils because they could create serious problems in the hydraulic double piston cylinder's rotation at high speeds and with cold oil. Oil must be changed at least every 12-18 mounth.

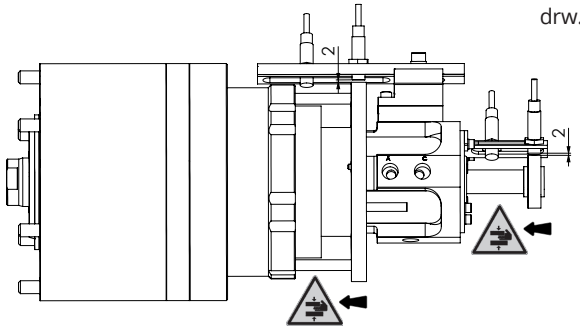
5. PRECAUTIONS

5.1 ⚠ Before connecting the hydraulic double piston cylinder to the machine hydraulics, ensure there is no foreign matter and metal parts circulating in the system. Link the two feeding tubes directly and allow the oil to circulate for about 30 minutes at maximum pressure so that it is completely filtered. Then clean the filters.

5.2 During the mounting operations and/or setting of the stroke control, pay attention not to pinch your fingers and hands between the axial moving strole control disks and the fixed cylinder parts (see drw.5).

5.3 To detect the axial position of the two pistons, two proximity switchces are used on the rear side (rear piston), and on the center part of the cylinder (front piston). The optimal radial distance between the switch and the stroke control disk is 2 mm (see drw.5). If optional stroke control systems (type PXP or LPS 4.0) were purchased, follow the specific instructions written in the instruction manual supplied with the stroke control kit purchased.

drw. 5



PINCHING AND BAD INJURIES DANGER!

5.4 Before operating the chucking system, operated by a hydraulic double piston cylinder carry out the following tests:

A) ⚠ Open and close the chuck at low pressure checking that the hydraulic double piston cylinder moves properly without hindrance and that there are no leaks.

B) ⚠ Rotate the chuck at low speed for 15 minutes, checking that the delivery pipes, drain tubes or the anti rotation bracket do not hamper this movement.

C) ⚠ Bring the pressure to operating level and make another 8-10 movements.

D) ⚠ Gradually increase the rotation speed and check that the feeding oil has a minimum temperature of 35° C before attaining the max speed.

5.5 **IMPORTANT**

A) ⚠ Never allow the hydraulic double piston cylinder to rotate without oil pressure. This will damage the bearings, cause seizure of the distribution ring and the body.

B) ⚠ Never rotate hydraulic double piston cylinder at high speed with cold oil; this could damage the bearings and the manifold ring. We recommend making a few movements (opening/closing) at a low speed before starting.

6. ANALYSIS OF THE RISKS AND SAFETY STANDARDS

6.1 DIRECT RISKS

⚠ The hydraulic double piston cylinders DCN-DCU-DCR-DCE consit of two parts: one is fixed and one rotates at high speed. As a consequence, there is the possibility of a seizure between the two parts in case of non-compliance with the correct installation and maintenance instructions.

A) INSTALLATION

1. Carefully read and follow the instructions of pos. 3 -4 and 5 of this manual. Special care must be given to paragraph 5.
2. Carefully read the "guide to the solution of the problem", pos. 1 - 7.
3. ⚠ Caution. when the hydraulic double piston cylinder is rotated for the first time, be careful that ALL PERSONNEL STAND WELL CLEAR OF THE hydraulic double piston cylinder.

B) USE AND MAINTENANCE

To avoid a seizure during the operation, carefully follow the instructions of paragraph 5 of this manual.

6.2 INDIRECT RISKS

Indirect risks are the risks that can derive from improper working or driving of the hydraulic double piston cylinder, when clamping components with power chucks or collets.

A) ⚠ THE MACHINE MUST BE ALLOWED TO ROTATE ONLY UNDER THE FOLLOWING CONDITIONS:

1. After having checked with a pressure gauge that the feeding circuit has reached the requested pressure.
2. After the proximity swithces (2 pcs or more) have confirmed the position of "component clamped".

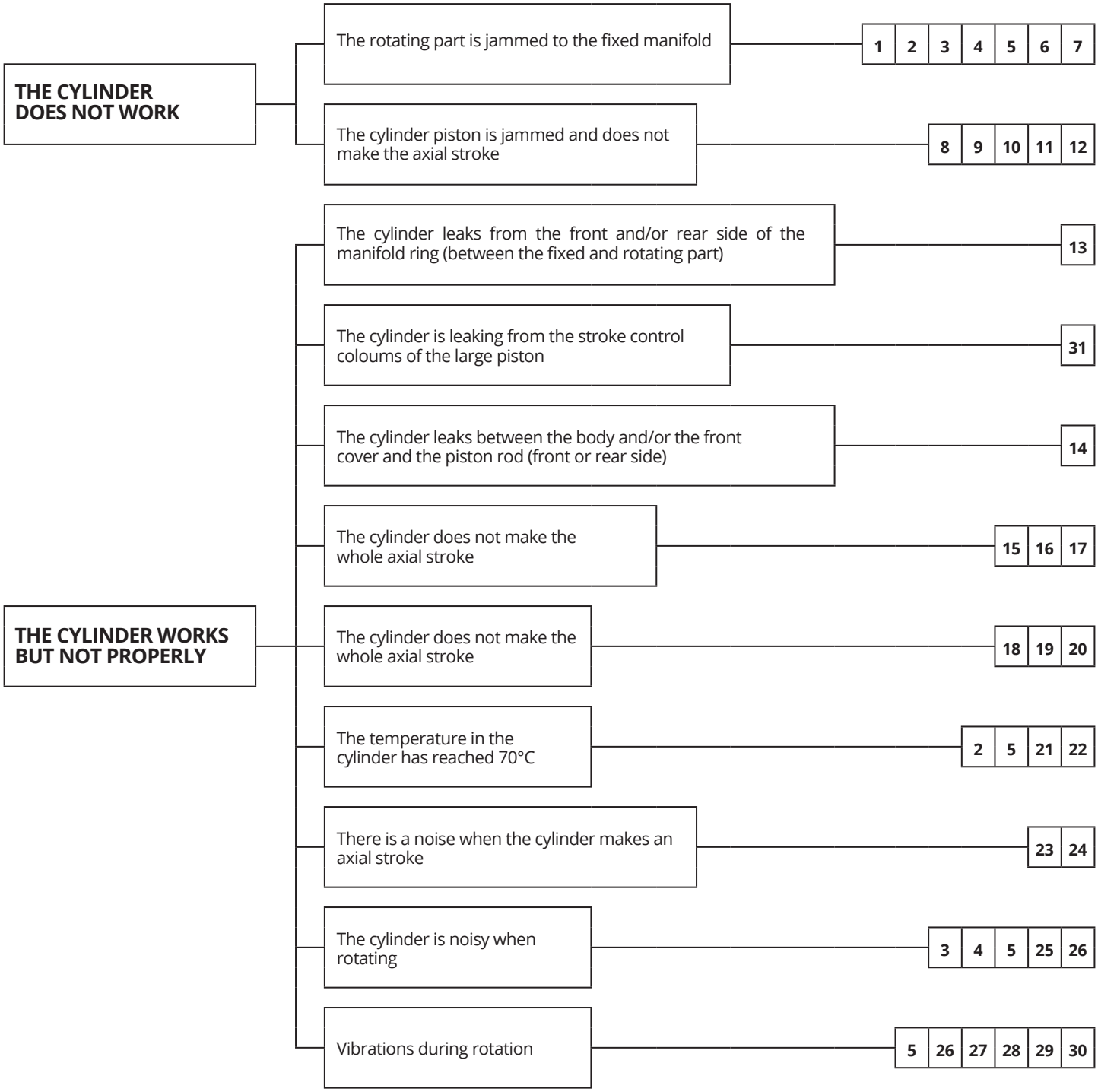
B) ⚠ The electric and hydraulic circuits of the machine must guarantee that the component cannot move during the spindle rotation (safety agaist an accidental opening / closing of the workholding system).

C) ⚠ It is necessary to use double-solenoid valves with detented positions, to ensure that the position is kept in the case of lack of current (to prevent the opening of the jaws of the chuck).

D) ⚠ INSPECTION OF THE SAFETY VALVES OF THE CYLINDER

After the start of use of the hydraulic double piston cylinder, the efficiency of the safety valves must be checked every 1 year, or 500.000 cycles. To make this inspection it is necessary to mount 2 gauges (not supplied) on the drain holes A and B (see page 14-15) by means of suitable fittings.

Bring the pressure to about 30 bar, alternating in the two chambers of the hydraulic double piston cylinder, to check that, when cutting off the feed, the pressure in the chamber does not drop below 10 bar, for at least 4 - 5 minutes.


THE CYLINDER DOES NOT WORK
The rotating part is jammed to the fixed manifold
1 2 3 4 5 6 7
The cylinder piston is jammed and does not make the axial stroke
8 9 10 11 12
THE CYLINDER WORKS BUT NOT PROPERLY
The cylinder leaks from the front and/or rear side of the manifold ring (between the fixed and rotating part)
13
The cylinder is leaking from the stroke control coloums of the large piston
31
The cylinder leaks between the body and/or the front cover and the piston rod (front or rear side)
14
The cylinder does not make the whole axial stroke
15 16 17
The cylinder does not make the whole axial stroke
18 19 20
The temperature in the cylinder has reached 70°C
2 5 21 22
There is a noise when the cylinder makes an axial stroke
23 24
The cylinder is noisy when rotating
3 4 5 25 26
Vibrations during rotation
5 26 27 28 29 30

SOLUTION OF THE ABOVE PROBLEMS Note: See also drawing at pages 14-15

1	This is the most serious damage thet can occur to the hydraulic double piston cylinders; it means that the rotating part of the hydraulic manifold (body) is jammed in the fixed part (manifold ring). This situation occurs when the oil in the cylinder is not perfectly clean or has some metallic particles or foreign parts inside and can be caused when: - The oil fliters are insufficient of damaged - The circuit and the hydraulic tubes are not perfeclty clean. For other possible reasons, please see pos. 2 to 5; for possible solutions, please see pos. 6 and 7.
2	Use of improper oil. An oil with too high a viscosity causes a very high local heating, when working at high speed with cold oil. It can also cause overheating in normal conditions.
3	The hydraulic double piston cylinder has been rotated without oil pressure.
4	The fittings used have conical or too long threads, that cause the deformation of the manifold ring.
5	The oil feeding or the oil drain tubes or the stop fork heve been mounted in such a way to apply an axial stress on the manifold ring, damaging the bearings.
6	If there is only a slight seizure, it is recommended to disassemble the manifold ring, remove the seizure by an abrasive stone and replace the bearings. Carefully clean before reassembling.
7	If the seizure is more serious, it becomes very difficult to dismantle and repair the cylinder. In this case, it is recommended to send the cylinder to one of the "SMW-AUTOBLOK " Service Centers, for the repair or the replacement of the cylinder.
8	Check that there is no alarm signal in the operation system of the machine that could hinder the operation of the controls. Carefully check the electric circuit and the buttons.
9	Check to the hydraulic circuit controlling the cylinder stroke is in good working conditions and gives the requested pressure; check the following: A) the oil level in the tank B) the proper working of the pump C) the filters must not be clogged D) the solenoid valves must not be jammed E) the tubes must be properly connected
10	Be careful not to reduce the pressure to 1/3 (or less) in one move, as regards to the starting pressure: this would prevent the working of the safety valves, hence, the piston stroke. It is recommended to reduce the pressure gradually, making every time a movement of opening / closing.
11	One of the two safety valves jammed into its seat, due to different reasons (dirty oil, overpressure, water hammering, changes in temperature, wear of the internal components of the valves). - Keeping the power unit without pressure, carefully unscrew the 2 drain screws A and B (see page 14-15). - Be careful that one of the cylinder chambers is still under pressure.
	- By loosing these screws, a certain quantity of oil willl come out from one of them, resetting the valve control. - Reassemble and tighten the screws, then, operate the cylinder. If the piston does still not move, it is necessary to change 1 or 2 safety valves (see instructions)
12	Check that the draw tube for the connection to the chuck is not too long (or too short), causing a mechanical axial stop, hindering the piston stroke.
13	The oil seal between the front and rear parts of the oil manifold is made by means of rotating rubber seals (see drawing page 14-15). A) If the leakage is in the rear is it is only necessary to remove the rear cover 14 and change the rear seal 36. B) If the leakage from the front, it is necesary to dismantle the complete oil manifold group and change the front seal 36. In this case our suggestion is to also change the rear seal and the bearings 45 and 46 which could have been damaged during the dismanlting operations.
14	If the leakage is in the front side between the body 1 and the piston rod 3 it is necessary to change the rubber seal 53. If the leakage is in the rear, between the distribution flange 10 and the piston rod 13 it is necessary to change the rubber seal 35.
15	Let's suppose that the machine tool manufacturer dimensioned the power unit considering the real needs of oil capacity. If the power unit is well dimensioned, there can be two kinds of problems: - in the hydraulic circuit - in the cylinder
16	Problems in the hydraulic circuit: A) The filters are clogged and do not allow the regular flow of the pump capacity: in this case, clean the filters and, if necessary, replace them. **NOTE**: Be careful that the delivery filter must be a paper filter with 10µ aperture size and must be replaced every 6 - 8 months. B) The pump is worn and does not guarantee the regular delivery. Measure the delivery in l/min. and, if it is not enough, replace the pump. C) The solenoid valves do not make the whole stroke and reduce the room for the oil flow. It can be caused by wear of the valves or by the entry of dirty oil between the pistons.
17	Problems in the hydraulic double piston cylinder. To be sure if the problem is in the hydraulic circuit or in the cylinder, mount 2 gauges in the drain holes A and B, using 2 suitable fittings (see pages 14-15). The problems in the hydraulic double piston cylinder can be caused by: A) Wear or breakage of the main seal 50 and 52 of pistons (see pages 14-15) in this case, replace the seal. B) One of the pressure relief valves 22 is open, due to dirt or to the unsetting of the springs. Try to pressurize and to relieve the pressure a few times, by switching the power unit on and off. If the valve still remains clogged, it is necesary to dismantle the double piston cylinder and replace the internal components of the valves.
18	Usually, only a part of the double piston cylinder total strokes are used to drive a standard chuck. To determine the length of the connection draw tubes, remember that the front limit switch is on the double piston cylinder and the rear one on the chuck. If the draw tube has been wrongly designed or manufactured, the double piston cylinder will not make all the stroke requested by the chuck.
19	An unexplained reduction in the double piston cylinder stroke (and in the stroke of the top jaws) can be due to an accidental unscrewing of the draw tube (both from the double piston cylinder side and from the chuck side). Screw the draw tube properly and lock it.
20	There could be some problems in the chuck: check carefully.
21	The increase in the oil temperature is only slightly influenced by the double piston cylinder; it is mainly caused by the hydraulic circuit. A good power unit shoul be able to keep the oil temperature between 35° and 65° C, even in the worst working conditions. If the temperature is higher than 70° C, it is recommended to increase the oil volume, by adding an auxilliary tank or by using a system of temperature conditioning.
22	Check the oil level in the power unit: a reduction in the oil volume causes an increase in the temperature.
23	Insufficient lubrication of the chuck can cause noises during the clamping and unclamping of the component. Dismantle the chuck and grease it with SMW-AUTOBLOK "K67" grease.
24	Also the partial or total breakage of the draw tube or of the threads can cause an irregular noise: in this case, replace the damaged parts
25	If there are vibrations when the hydraulic double piston cylinder is in thrust conditions (both when driving a chuck or a collet), this is due to the combined bending and compressive stress on the draw tube. In this case, it is recommended to insert 1 or 2 bronze bushings, to guide the draw tube onto the I.D. of the spindle
26	When there is too much noise between the fixed manifold ring and the rotating part, it is possible that the bearings are going to have a problem, due to dirty oil or wear. Replace the bearings, check the fliters and change the oil.
27	Check that the hydraulic double piston cylinder and the flange turn perfectly (see mounting Instructions - pos. 2).
28	Check that possible shocks of bars against the hydraulic double piston cylinder hole or other vibrations have not loosen the fixing screws of the cylinder to the fixing flange and/or the fixing screws of the cylinder body to the distribution flange. This could knock these parts off center. Check carefully and center again.
29	Check that the draw tubes are not unbalanced , off center, out of traightness or too bent in thrust conditions. Reminder - The draw bar has to be supported by means of 2 bushes in order to avoid bending under peak pushing load.
30	Check carefully, removing the component, then the top jaws, the chuck, the draw tubes, the cylinders, the flanges, until there are no more vibrations. Then, balance the part removed last.
31	Check the correct sealing of the seals 56 on the piston rods 12 and if necessary substitute them.

DISMANTLING AND REASSEMBLY OF DOUBLE PISTON CYLINDERS

Note: See also drawing at pages 14-15

DISMANTLING

A) Operations to follow before removing the cylinder form the machine.

1. Reduce the pressure to about 10 bar (while the piston is moving).
2. Push the piston to about the half of its stroke.
3. Cut off the pressure from the circuit and remove the feeding and drain pipes.
4. By means of compress air, alternatively blow into the feeding fittings and collect the oil coming out from the other fitting.
5. Removal of the proximity bracket "18 and 26".

   It is now possible to remove the complete unit, without affecting the adjustment of the stroke control. Take care not to damage the wires and the proximity switches fastened to the support.
6. Remove the double piston cylinder from the machine and put it on the bench.

B) Dismantling of the pistons.

1. Dismantle the stroke control disks "16 and 27".
2. Remove the screws 65 that hold the body 5 to the rear flange 10.
3. Axially remove the oil manifold unit (complete of seals and bearings).
4. Remove the screws "66" that hold the intermediate flange 2 to the body 5 and the body 1, using a plastic hammer on rod 7.
5. Remove the body 5.
6. Axially remove the rod 7.
7. Axially remove the piston 3 hitting with a plastic hammer on the rod, also the intermediate flange 2 will be disassembled.
8. Axially remove the intermediate flange 2 from the piston 3.

C) Dismantling of the hydraulic feeding manifold: (to be done only in case of proven damage to the bearings 45 and 46 or to the seals "36 or 37").

NOTE. this operation can be carried out with the cylinder assembled on the machine.

1. Remove the cover "15"by unscrewing "41" and using the extraction holes.
2. Axially remove the oil manifold unit. CAUTION: the bearing are transition fits, therefore use an extractor.
3. Unscrew "14" and remove circlip "37".
4. Extract front seal "36 and 37" and if damaged extract "45" e "46".

D) If it is necessary to replace the pressure relief valves, follow the instructions listed below:

1. It is possible to replace only the internal component of the valve "22"; the housing is integral with the piston.
2. Measure with a gauge the position of the plug of the pre-loaded spring with regard to the edge of the housing.
3. Unscrew the plug. (Caution: the plug is fastened with loctite).
4. Remove the valve and replace the spare parts with the new ones inserting in the same way as removed parts.
5. Screw the plug in, as deep as before, and put some loctite to fix it properly. The positioning of the plug is very inportant, because it gives the pre-load of the spring, controlling the opening of the valve.

E) Should it be necessary to replace the safety valves proceed as follows:

NOTE: this operation can be carried out with the cylinder assembled on the machine.

1. Located 2 large holes with plugs on the edge of flange "2" they are positioned opposite one-another (see section B-B).
2. Remove the two plugs "17". Paying attention to the seals 33 (see drawing).
3. Extract the valves using a forked tool.
4 Fit the new valves following the direction indicated on the drawing.
5. Refit the plugs and screw them back.

REASSEMBLY

A) Reassembly of the piston rods (part."3" and "7").

1. Mount the piston 3 on the body 1. Caution: Align the max pressure valves with the slots in the body. (Their covers act as anti rotation pins).
2. Mount the intermediate flange 2 on body 1.
3. Mount the piston 7 on the body 5, then insert them in the intermediate flange 2.
4. Mount the oil manifold unit on the body 5.

B) Reassembly of the bodies 2 and 1 (part. "5 and 1").

1. Grease and fit seals "56", "57" and "63".
2. Insert the piston "7" in the body "5" till the seal "50" enter in the body going over the entrance chamfer.
3. Take the body "5" and clock it with the flange "2" matching the two "A letters" written on the 2 parts.
4. At this stage finish inserting piston rod "7" and close the body "5" with flange "2" using screws .
5. Lighlty tighten screws "66".
6. Center with great care flange "2" with body "5".
7. Grease the seats and inserts the seals"45 and 19."
8. Insert the piston 3" in the body "1", paying attention not to damage the seal 49 during the insertion.
9. Take the body "1" and clock it with the flange "2" matching the two "A letters" written on the 2 parts.
10. At this stage finish inserting piston rod "3" and close the body "1" with flange "2" using screws"66".
11. With the maximum care, accurately center the flange "2" to the body "5" and the body 1.
12. Reassemble stroke control disk "27".

C) Reassembly of the collector ring of the hydraulic rotating joint (part."11").

1. Fit the bearings"45" and "46" in their place.
2. Assemble one ring "37" in seal carrier "11".
3. Mount the circlip "44".
4. Mount the seal "36" in the seat of the ring "11".
5. Assemble cover "14" on ring "11" and fix it with screws "38".
6. Slightly warm the assembly (+20° C over temperature) e mount it on rear flange "10".
7. Reassemble cover "15".

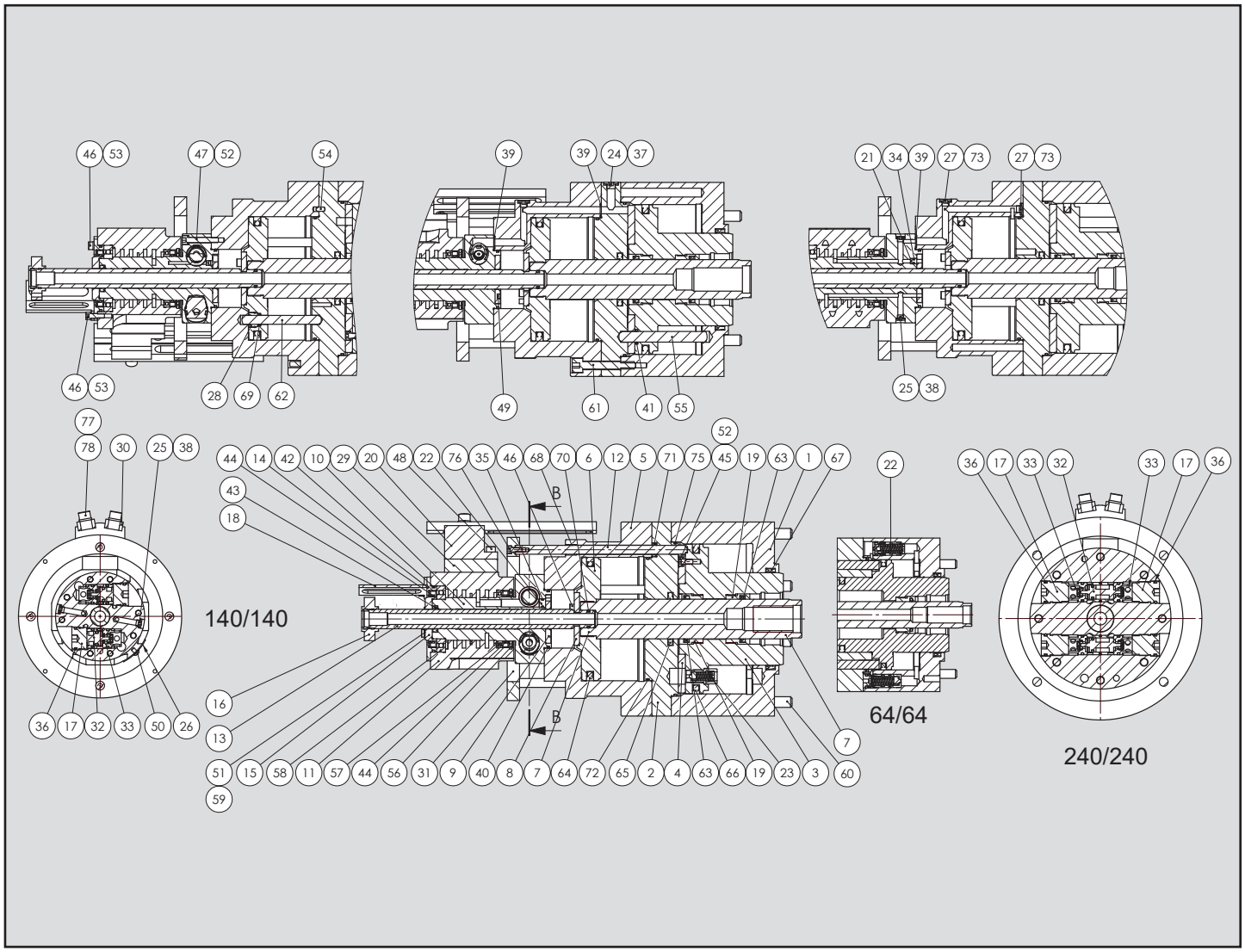
D) Assembly of the double piston cylinder on the side of the machine.

1. Following the assembly instructions, center the body to the rotational axis of the machine spindle, then thighten the fixing screws.

E) Mounting of the proximity bracket.

1. Mount the proximity bracket "18" fixing it with screws "41" taking care not to damage wires or the poximity switches. Mount the support 26 with the screws 61.

DCE: LISTA RICAMBI / SPARE PARTS LIST



1	Corpo 1	Body 1
2	Flangia centrale	Middle flange
3/A	Pistone 1	Piston 1
4	Flangia	Flange
5	Corpo 2	Body 2
6/B	Pistone 2	Piston 2
7/B	Stelo pistone	Piston shaft
8	Flangia pist. 2	Piston 2 flange
9	Coperchio	Cover
10	Flangia poster.	Rear flange
11	Presa olio	Oil manifold
12	Asta contr. cors.	Stroke cont. rod
13	Asta contr. cors.	Stroke cont. rod
14	Coperchio post.	Rear cover
15	Coperchio cusc.	Bearing cover
16	Disco controllo corsa	Stroke control disc
17	Tappo	Plug
18	Supporto sens.	Sensor bracket
19	Guida boccola	Bushing guide
20	Supporto	Support
21	Tappo	Plug
22	Tappo	Plug
23/A	Valvola max.pressione	Max pressure valve

24	Tappo	Plug
25	Tappo	Plug
26	Targhetta	ID plate
27	Tappo	Plug
28	Bussola	Bushing
29	Distanziale	Spacer
30	Supporto sens.	Sensor bracket
31	Disco controllo corsa	Stroke control disc
32	Pilota valv sicur	Safety valv pilot
33	Valvola sicurezz	Safety valve
34	O-Ring	O-Ring
35	O-Ring	O-Ring
36	O-Ring	O-Ring
37	Rondella USIT	USIT washer
38	Rondella USIT	USIT washer
39	O-Ring	O-Ring
40	O-Ring	O-Ring
41	O-Ring	O-Ring
42	O-Ring	O-Ring
43	Guarnizione	Seal
44	Guarnizione	Seal
45	Vite DIN7984 8.8	Screw DIN7984 8.8
46	Vite UNI5931 8.8	Screw UNI5931 8.8

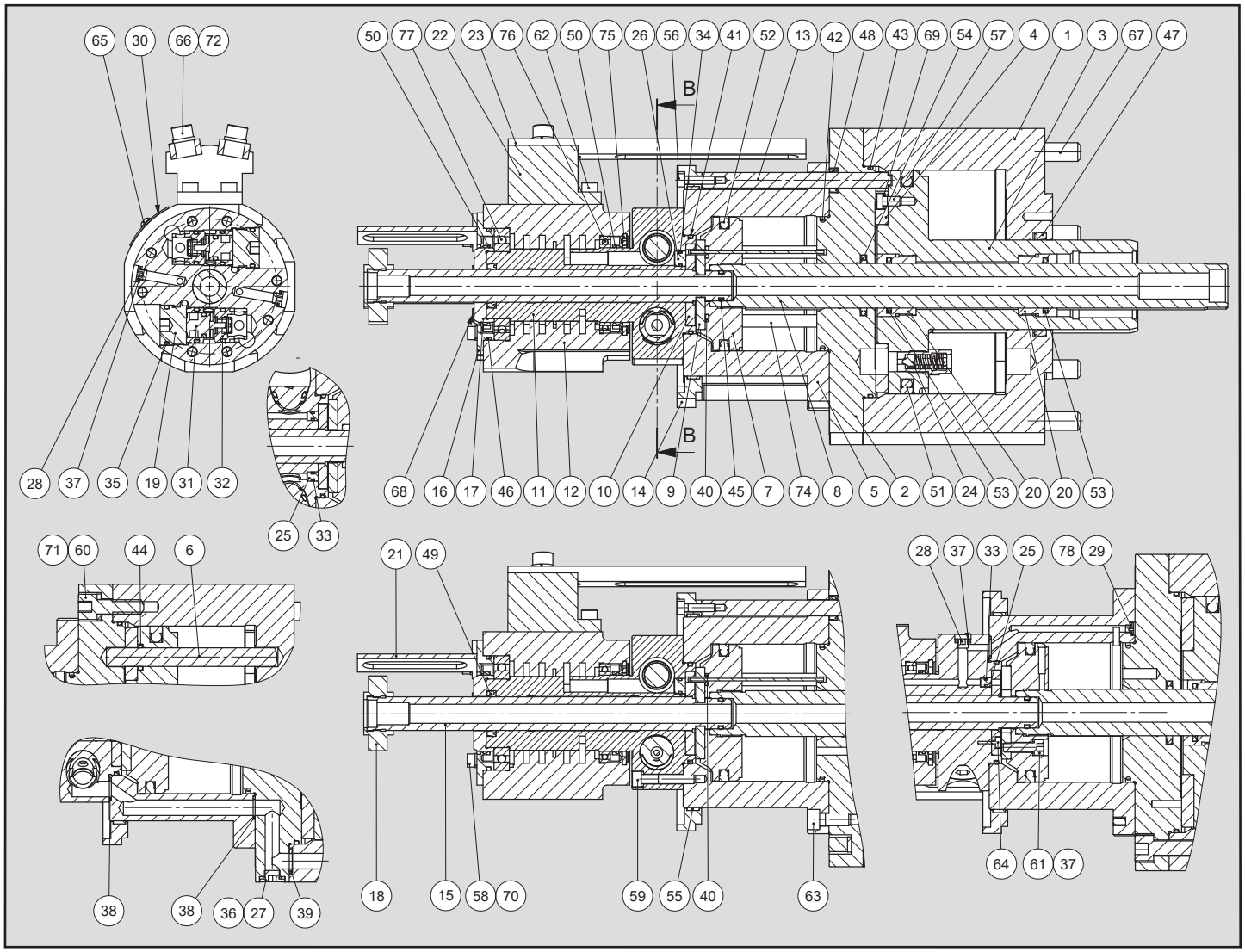
47	Vite UNI5931 12.9	Screw UNI5931 12.9
48	Vite UNI5931 8.8	Screw UNI5931 8.8
49	Vite DIN7984 8.8	Screw DIN7984 8.8
50	Vite ISO7380 8.8	Screw ISO7380 8.8
51	Vite UNI5931 12.9	Screw UNI5931 12.9
52	Rondella elastic	Spring washer
53	Rondella elastic	Spring washer
54	Spina cilindrica	Dowel pin
55	Spina cilindrica	Dowel pin
56	Seeger UNI7437	Circlip UNI7437
57	Cuscinetto	Bearing
58	Cuscinetto	Bearing
59	Rondella USIT	USIT washer
60	Vite UNI5931 8.8	Screw UNI5931 8.8
61	Vite UNI5931 8.8	Screw UNI5931 8.8
62	Spina cilindrica	Dowel pin
63	Guarnizione	Seal
64	Guarnizione	Seal
65	Guarnizione	Seal
66	Guarnizione	Seal

67	Guarnizione	Seal
68	Boccola	Bushing
69	O-Ring	O-Ring
70	O-Ring	O-Ring
71	Guarnizione	Seal
72	O-Ring	O-Ring
73	Rondella USIT	USIT washer
74	O-Ring	O-Ring
75	O-Ring	O-Ring
76	Vite UNI5931 8.8	Screw UNI5931 8.8
77	Rondella elastic	Spring washer
78	Vite UNI5931 8.8	Screw UNI5931 8.8

KIT RICAMBIO / SPARE PARTS KIT
Pistone 1 unità KIT (parti con/A) / Piston 1 unit KIT (parts with/A)
Pistone 2 unità KIT (parti con/B) / / Piston 2 unit KIT (parts with/B)
Kit completo di guarnizioni / Complete seals kit

NOTA: In fase di ordinazione dei pezzi di ricambio citare sempre il numero seriale del prodotto.
NOTE: When ordering, always give serial No. of the product.

DCN-DCR-DCU: LISTA RICAMBI / SPARE PARTS LIST



1	Corpo 1	Body 1
2	Flangia centrale	Middle flange
3/A	Pistone 1	Piston 1
4	Flangia	Flange
5	Corpo 2	Body 2
6	Perno	Pin
7/B	Pistone 2	Piston 2
8/B	Stelo pistone	Piston shaft
9	flangia pist. 2	Piston 2 flange
10	Coperchio	Cover
11	Flangia poster.	Rear flange
12	Presa olio	Oil manifold
13	Asta contr. cors	Stroke cont rod
14	Disco controllo corsa	Stroke control disc
15	Asta contr. cors	Stroke cont rod
16	Coperchio post.	Rear cover
17	Coperchio cusc.	Bearing cover
18	Disco controllo corsa	Stroke control disc
19	Tappo	Plug
20	Guida boccola	Bushing guide
21	Supporto sens	Sensor bracket
22	Supporto staffa	Bracket support
23	Supporto sens	Sensor bracket

24/A	Valvola max. pressione	Max pressure valve
25	Tappo	Plug
25	Tappo	Plug
27	Tappo	Plug
28	Tappo	Plug
29	Tappo	Plug
30	Targhetta	ID Plate
31	Pilota valv sicur	Safety valv pilot
32	Valvola sicurezz	Safety valve
33	O-Ring	O-Ring
34	O-Ring	O-Ring
35	O-Ring	O-Ring
36	Rondella USIT	USIT washer
37	Rondella USIT	USIT washer
38	O-Ring	O-Ring
39	O-Ring	O-Ring
40	O-Ring	O-Ring
41	O-Ring	O-Ring
42	O-Ring	O-Ring
43	O-Ring	O-Ring
44	O-Ring	O-Ring
45	O-Ring	O-Ring
46	O-Ring	O-Ring
47	Guarnizione	Seal

48	Perno cilindrico	Seal
49	Guarnizione	Seal
50	Guarnizione	Seal
51	Guarnizione	Seal
52	Guarnizione	Seal
53	Guarnizione	Seal
54	Guarnizione	Seal
55	Guarnizione	Seal
56	Vite UNI5931 8.8	Screw UNI5931 8.8
57	Vite DIN7984 8.8	Screw DIN7984 8.8
58	Vite UNI5931 8.8	Screw UNI5931 8.8
59	Vite UNI5931 12.9	Screw UNI5931 12.9
60	Vite UNI5931 8.8	Screw UNI5931 8.8
61	Vite UNI5931 8.8	Screw UNI5931 8.8
62	Vite UNI5931 8.8	Screw UNI5931 8.8
63	Vite UNI5931 8.8	Screw UNI5931 8.8
64	Vite DIN7984 8.8	Screw DIN7984 8.8
65	Vite ISO 7380 10.9	Screw ISO 7380 10.9

66	Vite UNI5931 8.8	Screw UNI5931 8.8
67	Vite UNI5931 12.9	Screw UNI5931 12.9
68	Vite UNI5931 12.9	Screw UNI5931 12.9
69	Rondella elastic	Spring washer
70	Rondella elastic	Spring washer
71	Rondella elastic	Spring washer
72	Rondella elastic	Spring washer
73	Spina cilindrica	Dowel pin
74	Spina cilindrica	Dowel pin
75	Seeger UNI7437	Circlip UNI7437
76	Cuscinetto	Bearing
77	Cuscinetto	Bearing
78	Rondella USIT	USIT washer

KIT RICAMBIO / SPARE PARTS KIT

Pistone 1 unità KIT (parti con/A) /
Piston 1 unit KIT (parts with/A)

Pistone 2 unità KIT (parti con/B) / /
Piston 2 unit KIT (parts with/B)

Kit completo di guarnizioni /
Complete seals kit

NOTA: In fase di ordinazione dei pezzi di ricambio citare sempre il numero seriale del prodotto.
NOTE: When ordering, always give serial No. of the product.

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