



## Automatic Coupling System

for single and double-acting elements

max. operating pressure 500 bar, nominal diameter 4

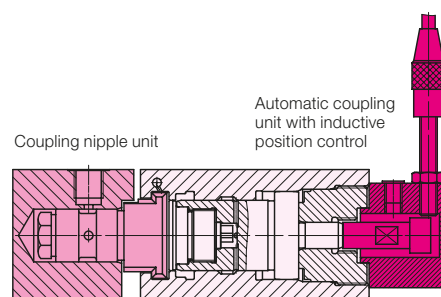


### Description

Standard automatic coupling systems for single and double-acting elements are available. Each coupling system consists of a coupling unit and the corresponding coupling nipple unit.

According to the application several components can be added to the coupling system that meet different safety requirements.

The automatic coupling systems allow coupling against system pressure up to a max. operating pressure of 500 bar.



### General characteristics

Efficiency of flexible manufacturing systems and quality of workpieces are increased by hydraulically-operated fixtures which can be automatically connected to and disconnected from the power source.

Coupling systems which were designed for that purpose can be used in combination with changing pallets for single and double-acting elements and also for several clamping circuits with a max. operating pressure of 500 bar. Retrofitting is possible.

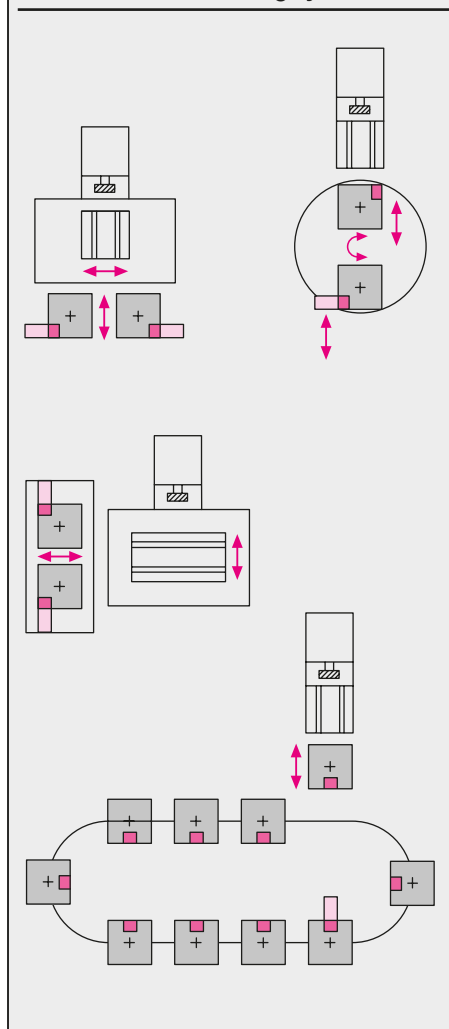
Clamped fixtures which are disconnected from the power unit can be monitored from time to time by a control cylinder in connection with signal switches or continuously by infra-red pressure monitoring.

We do not only deliver hydraulic clamping elements, we also design and build the required hydraulic, electric and electronic control.

### Adapted versions

We are in the position to deliver modified coupling versions according to your specific requirements. Please contact us.

### Application examples in flexible manufacturing systems



### Construction

The coupling unit contains the real coupling element which is integrated in the coupling piston. The coupling piston extends or retracts for coupling and uncoupling, respectively.

The front of the coupling element is flat and therefore allows easy cleaning.

At each standard version the uncoupled position of the coupling piston can be controlled by inductive proximity switches or by electro-pneumatic differential pressure switches, depending on the corresponding version. For controlling the coupled mode a second switch is required.

At the pressure side of the coupling nipple unit a non-return valve is installed and at the pressureless side a double check valve with a pretension of approx. 6 bar is installed. This double check valve works only in uncoupled mode and prevents the pressure to increase in the return line, if there is an internal leakage in the clamping system. The insertion nipples in the nipple unit allow a radial misalignment adjustment of  $\pm 0.5$  mm and an axial misalignment adjustment of  $\pm 1$  mm.

The standard version is equipped for pipe connection G 1/4. Special versions of the automatic coupling system, e.g. manifold mounting version or modified number of couplings are available on request. Please describe characteristic features in detail when sending your inquiry.

If oil supply on the pallet shall be effected through drilled channels threaded-body nipples can be installed directly in the pallet.

The axial forces  $F_{ax} [N] = 15,4 \times p [\text{bar}]$  are generated during the coupling process.

# Automatic coupling system for single-acting elements max. operating pressure 500 bar • nominal diameter 4

## Function

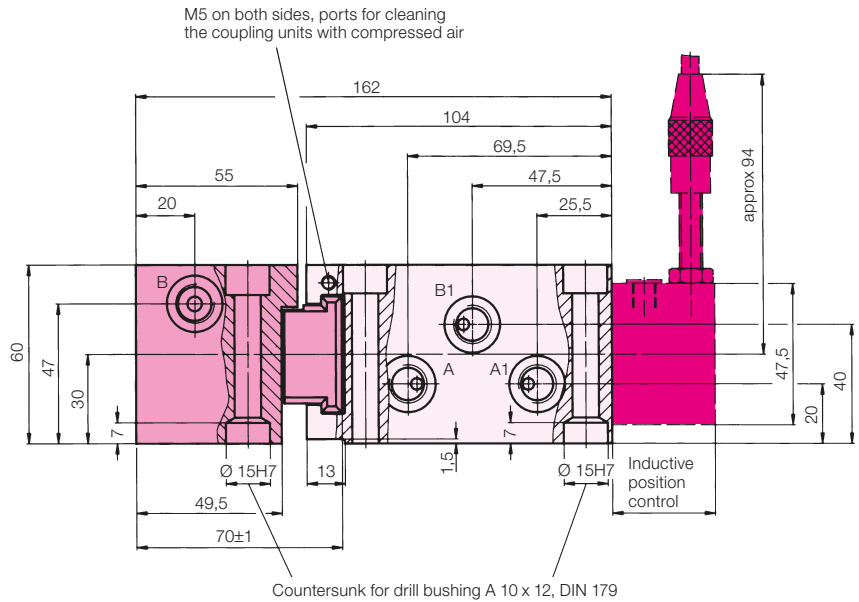
Positioning of the coupling nipple unit is made by lateral insertion into the T-slot-type claw of the coupling unit. When port A1 is pressurised the coupling piston extends. After the coupling piston is extended the check valves in the coupling nipple unit and the coupling piston are opened. Both check valves can be opened against system pressure.

Oil supply is made through port A.

To disengage the coupling port B1 is pressurised. The proximity switch registers the retracted end position of the coupling piston, then the pallet equipped with the coupling nipple unit can move.

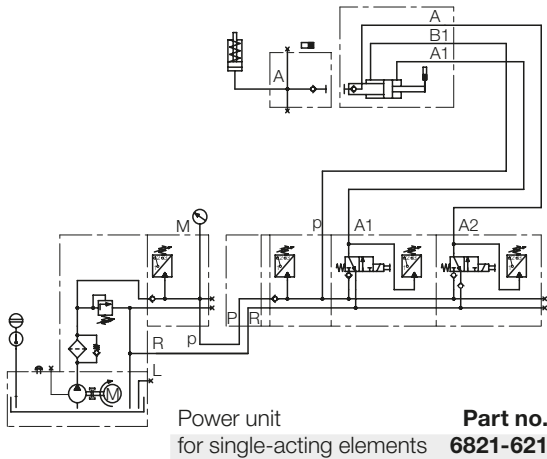
Oil supply in the coupling unit is made as per the hydraulic circuit diagram (special versions on request).

Due to safety reasons the coupling unit is operated by means of a so-called differential system, i.e. port B1 is not controlled by a valve and is directly connected to the pump.

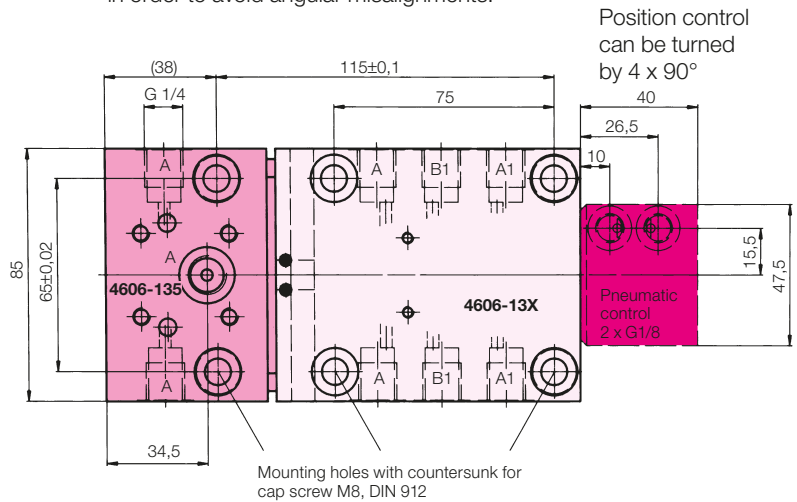


Dimensions  $70 \pm 1$ ,  $115 \pm 0.1$  and 162 indicate the central position of the axial misalignment compensation of  $\pm 1$  mm. Tolerances  $\pm 0.02$  and  $\pm 0.1$  are only valid for  $\varnothing 15$  H7

## Hydraulic circuit diagram

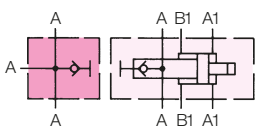


The mounting surfaces for coupling unit and coupling nipple unit have to be parallel in order to avoid angular misalignments.



## Automatic coupling unit without position control of the coupling piston

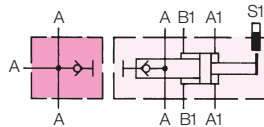
### Symbol



Coupling system	Part no.
Automatic coupling unit	4606-130
Coupling nipple unit	4606-135

## Automatic coupling unit with inductive position control of the coupling piston

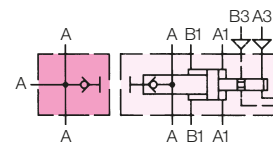
### Symbol



Coupling system	Part no.
Automatic coupling unit	4606-131
Coupling nipple unit	4606-135

## Automatic coupling unit with pneumatic position control of the coupling piston

### Symbol



Coupling system	Part no.
Automatic coupling unit	4606-132
Coupling nipple unit	4606-135

# Automatic coupling system for double-acting elements max. operating pressure 500 bar • nominal diameter 4

## Function

Positioning of the coupling nipple unit is made by lateral insertion into the T-slot-type claw of the coupling unit. When port A1 is pressurised the coupling pistons extend. After the coupling piston is extended the check valves in the coupling nipple unit and the coupling piston are opened. Both check valves can be opened against system pressure.

Oil supply is made through port A and B.

To disengage coupling ports B1 and B2 are pressurised. The proximity switches register the retracted position of the coupling positions.

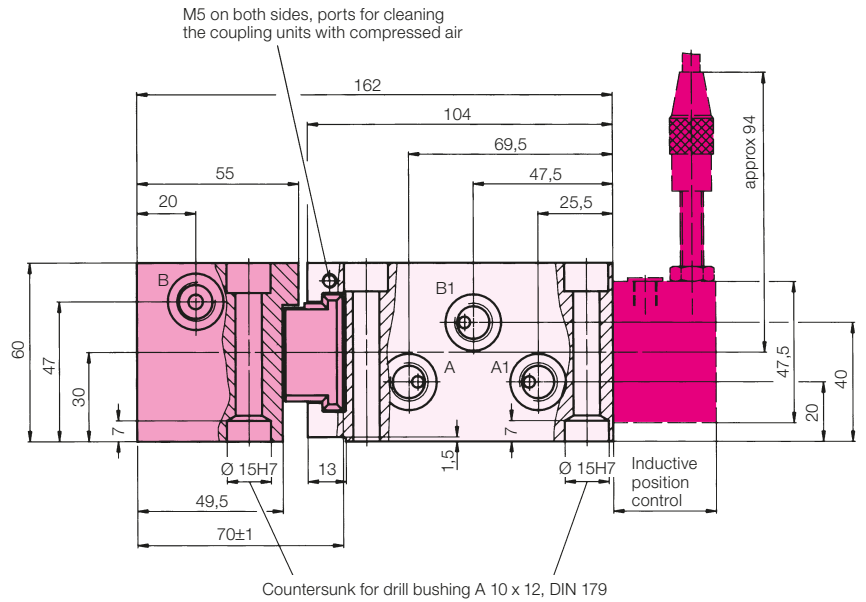
**To disengage coupling, port B (return line) must not be under pressure.**

Oil supply in the coupling unit is made as per the hydraulic circuit diagram (special versions on request).

Due to safety reasons the coupling unit is operated by means of a so-called differential system, i.e. port B1 and B2 are not controlled by a valve and are directly connected to the pump.

## Note

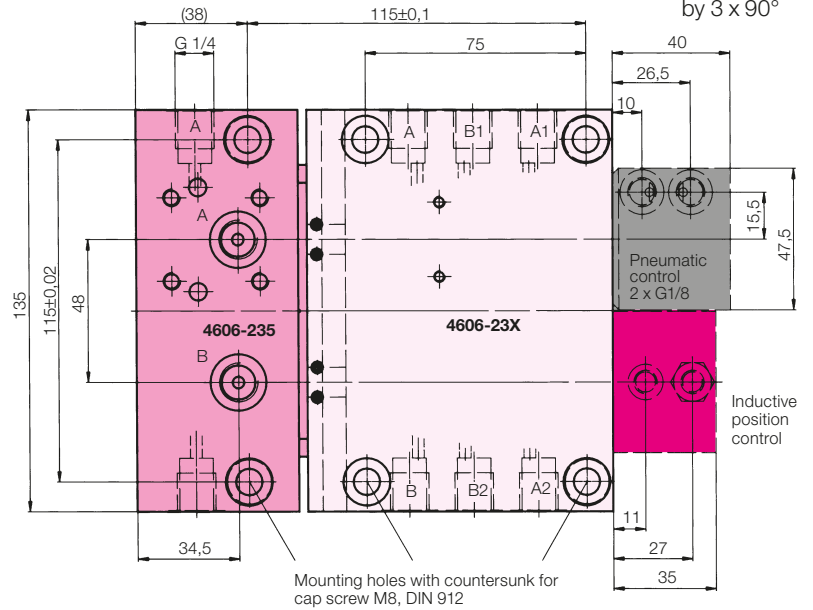
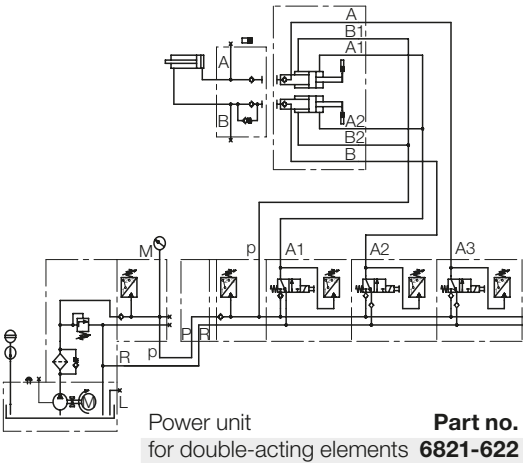
If the fixture has to be uncoupled in unclamped mode, the check valves shown in the hydraulic circuit diagram have to be provided in port R.



Dimensions 70 ±1, 115 ±0.1 and 162 indicate the central position of the axial misalignment compensation of ±1 mm. Tolerances ±0.02 and ±0.1 are only valid for Ø 15 H7

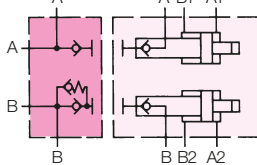
Position control can be turned by 3 x 90°

## Hydraulic circuit diagram



## Automatic coupling unit without position control of the coupling pistons

### Symbol



### Coupling system

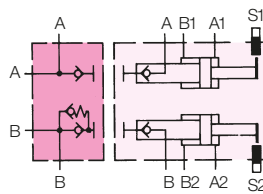
Automatic coupling unit  
Coupling nipple unit

### Part no.

**4606-230**  
**4606-235**

## Automatic coupling unit with inductive position control of the coupling pistons

### Symbol



### Coupling system

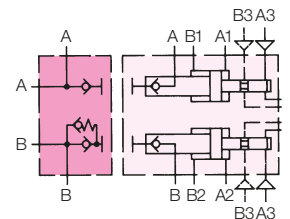
Automatic coupling unit  
Coupling nipple unit

### Part no.

**4606-231**  
**4606-235**

## Automatic coupling unit with pneumatic position control of the coupling pistons

### Symbol



### Coupling system

Automatic coupling unit  
Coupling nipple unit

### Part no.

**4606-232**  
**4606-235**

# Possibilities of installation

## Pressure monitoring

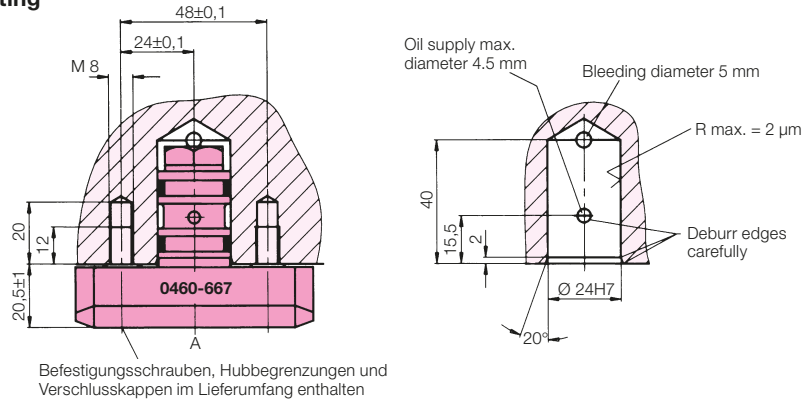
### Insertion nipples for direct installation

The insertion nipples can be directly installed into the pallet or a fixture base plate. Then oil supply to the elements is effected through drilled channels. Misalignment compensation is possible (radial  $\pm 0.5$ ; axial  $\pm 1$ ).

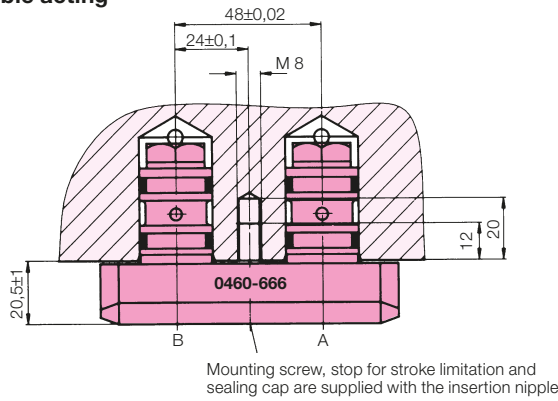
Insertion nipple 0460-667 is designed such that in uncoupled condition it is leakproof. Insertion nipple 0460-666 contains a double check valve. This nipple may only be installed in the return line, since due to the check valve a possible internal pressure in the line is limited to approx. 6 bar, when coupling is disengaged. The insertion nipples are used in combination with automatic coupling units.

Insertion nipple	Part no.
for single-acting elements	<b>0460-667</b>
for double-acting elements	<b>0460-666</b>

### Single acting



### Double acting



## Pressure monitoring on a disconnected pallet

### Monitoring with control cylinder

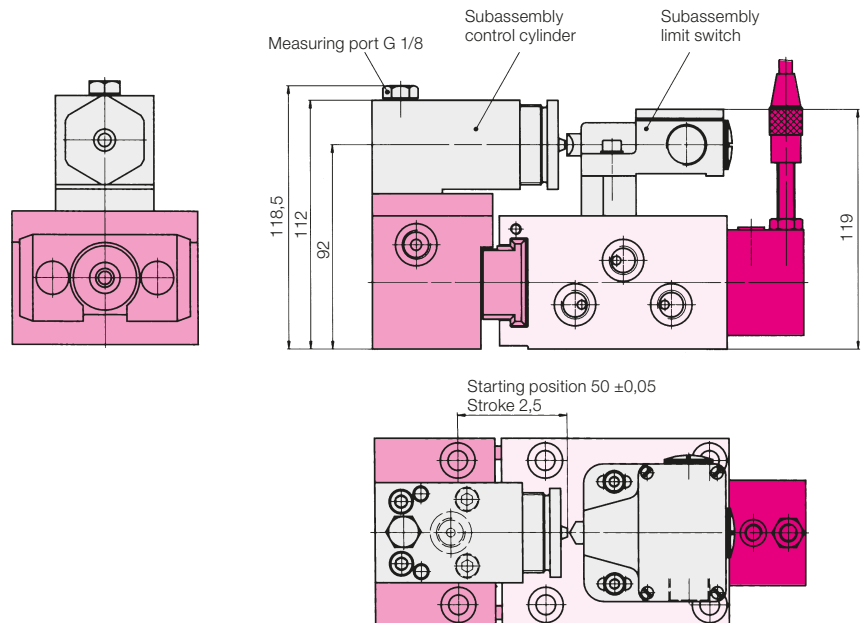
- spring-loaded control cylinder indicates via a signal switch "pressure is made" before pallet enters into the machining centre.
- The control cylinder is controlled from time to time during machining by a measuring probe.
- The pallet is moved into a defined position in the machining area, e.g. during tool change, where the control cylinder is sensed by means of an installed limit switch.

Retrofitting of subassemblies "control cylinder" and "limit switch" is possible for all coupling elements of this data sheet. For retrofitting a pressure control it is only required to make port "A" accessible for single-acting and double-acting coupling nipple units.

	Part no.
Subassembly control cylinder	<b>0974-000</b>
Subassembly limit switch	<b>0974-001</b>

The shown control cylinder has an adjusting range of 90-500 bar. Hysteresis is max. 15%. Pressure oil supply is effected by means of drilled channels and O-ring sealing. It is possible to install a measuring port at the G 1/8 port. Versions with G 1/4 port instead of O-ring connection are available on request.

	Part no.
O-ring flange-mounted type	<b>9740-025</b>
G 1/4 threaded-body nipple	<b>9740-802</b>



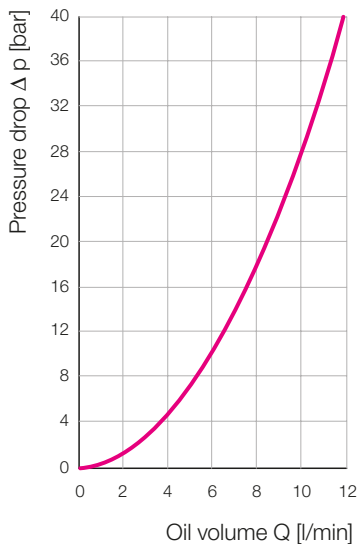
**General data**

Configuration	differential cylinder
Connection	G 1/4 for fittings with screwed plugs type B as per DIN 3852
Mounting position	any, preferably horizontal
Check valves	spring-loaded non-return valve with forced opening
Leakage rate	approx. 0.05 litres per 1000 operations

**Hydraulic data**

Viscosity range	(4-300) 10 <sup>-6</sup> m <sup>2</sup> /s
Recom. viscosity class	ISO VG 22 as per DIN 51519
Recom. hydraulic oil	HLP 22 as per DIN 51524
Max. oper. pressure	500 bar
Nominal diameter	ND4

Δ p-Q-Characteristic curve for cinematic viscosity 53 x 10<sup>-6</sup> m<sup>2</sup>s<sup>-1</sup> (HLP 22 at 20 °C)

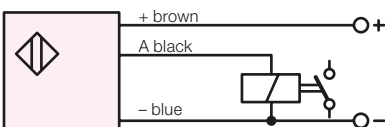


**Electric data of proximity switches**

Supply voltage U <sub>B</sub>	10–30 V DC
incl. residual ripple	max. 15%
No-load current	10–20 mA
Load	200 Ohm
Edge steepness	1 V/ys
Max. switching speed	1 kHz
Duty cycle	100%
Ambient temperature	–25 °C up to +70 °C
Code class	IP 67 (DIN 40050)

The proximity switch is protected against short circuits.  
The plug is supplied with 3 m of cable.

**Wiring diagram**



**Position control by pneumatic control system**

The control by means of an electro-pneumatic differential pressure switch can be effected by a so-called PEL gauging system. This system allows to connect several gauging points in parallel and control them with one gauging switch. Apart from the exact measuring, this system offers the advantage that there is no electric power required at the gauging point and the PEL switch can be mounted at the power unit. The gauging switches are not included in our delivery. Connection of the pneumatic line for the uncoupled position is made at port A3 and at port B3 for the coupled position.

Further information on the PEL system are available on request.

**Power units**

For automatic coupling systems power units with especially-adapted hydraulic and electric control are available. Schematic construction of such a power unit see hydraulic circuit diagrams. All standard power units are equipped with oil level and temperature control. If the oil level falls below a certain level or the oil temperature increases to 60°C or more, the electric motor is switched off.

After topping up the oil reservoir or after cooling of the oil the electric motor is automatically switched on. The electric control is designed as programmable control. If different clamping pressures are required during machining, power units with proportional pressure adjustment as per data sheet D 8.015 can be used. The programmable pressure adjustment allows to adjust the clamping pressure by means of the programme to the corresponding pressure of the machining step; therefore the M-functions of the machines are used. If existing hydraulic fixtures e.g. hydraulic machine tools are used, it is required to secure the ports A1, A2 and B1, B2 against unlockable pressure loss by means of check valves.

**General features**

From time to time tightness of static clamping systems should be checked. During 12 hours (e.g. overnight), in an installation equipped with an accumulator the pressure should only change in relation to the temperature (approx. 3-4 bar/°C). To check quickly the tightness of a system, functioning of the accumulator is stopped e.g. by unscrewing or shut-off by a high-pressure shut-off valve (ball valve).

**Important notes**

Couplings in general are disconnecting systems. Therefore a seal is required in order to seal both coupling parts to each other. This seal is not protected and therefore exposed to increased wear due to contamination. If there will be continuous leaks at the coupling system, when coupling is engaged, the coupling mechanism which is mounted at the front in the coupling piston has to be exchanged

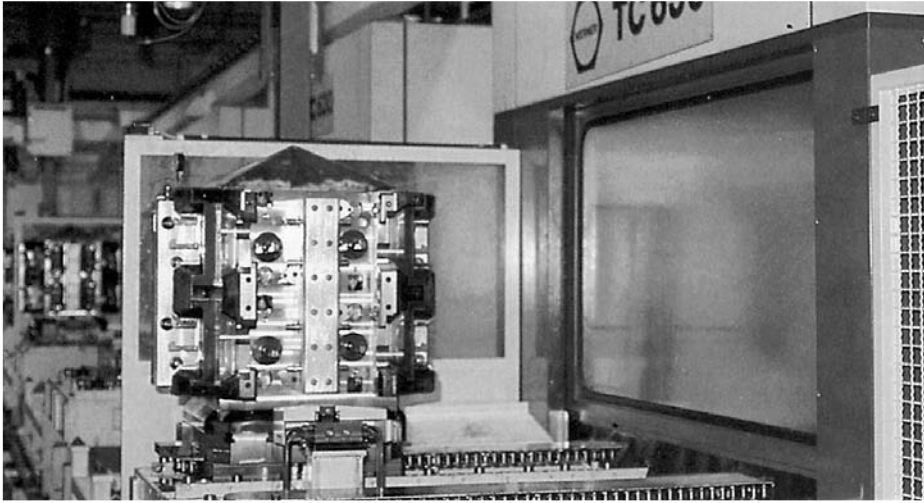
When using automatic coupling systems you have to follow the existing safety regulations. Operating conditions, tolerances and other data see data sheet A 0.100.

**Cleaning of coupling elements**

The smooth surfaces of the coupling unit allow a preliminary cleaning by elastic wipers. To improve cleaning of the sealing elements, jet holes with connecting thread M5 are integrated in the coupling nipple unit which allow blast cleaning or washing out of the seals.

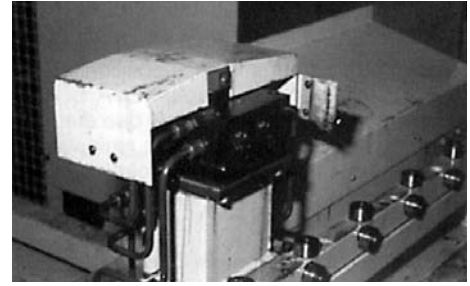
Accessories	Part no.
Inductive proximity switch	<b>3829-077</b>
Plug for inductive proximity switch	<b>3829-078</b>
Accumulator 75 cm <sup>3</sup> 500 bar	<b>9605-611</b>
Accumulator 13 cm <sup>3</sup> 500 bar	<b>9606-102</b>
Pressure gauge 0-600 bar	<b>9846-000</b>
Shut-off valve 500 bar	<b>2944-002</b>

## Application examples

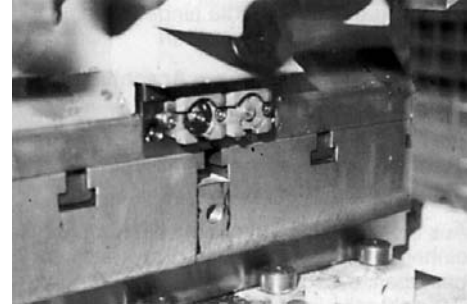


Automatic coupling system for double-acting clamping elements with control cylinder for pressure monitoring of uncoupled clamping fixtures.

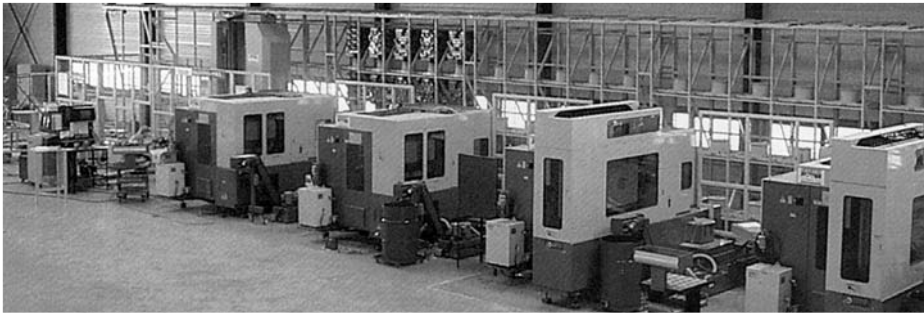
Each clamping fixture is allocated to a loading and unloading station with coupling system. The coupling nipple unit is integrated into the fixture body with a minimum use of space. The maximum operating pressure is approx. 300 bar. This pressure can be controlled at the control cylinder (adjustment range 90-500, hysteresis approx. 15%). 28 fixture pallets are used on 8 machining centres. The clamping pressure is maintained statically after pressurising i.e. during machining of the workpiece there is no connection to the pressure generator.



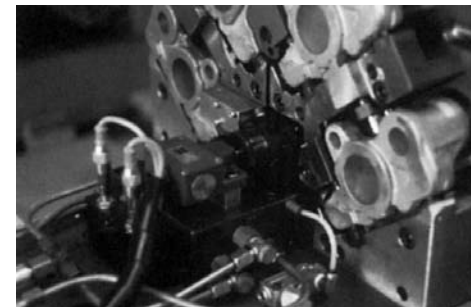
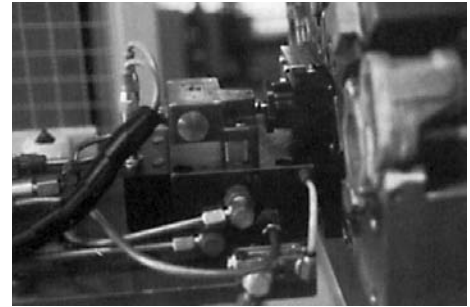
Coupling unit with limit switch



Nipple unit with control cylinder



16 fixture plates, which take 64 workpieces each are clamped and unclamped at two loading and unloading stations. The coupling units are operated by one pressure generator. Control is made by a programmable control of the pressure generator. In order to guarantee that the fixture cubes can be operated from the front, the whole fixture will be uncoupled and can be turned  $4 \times 90^\circ$ . The oil supply in the clamping fixture is made through drilled channels.



Coupling system with displacing unit