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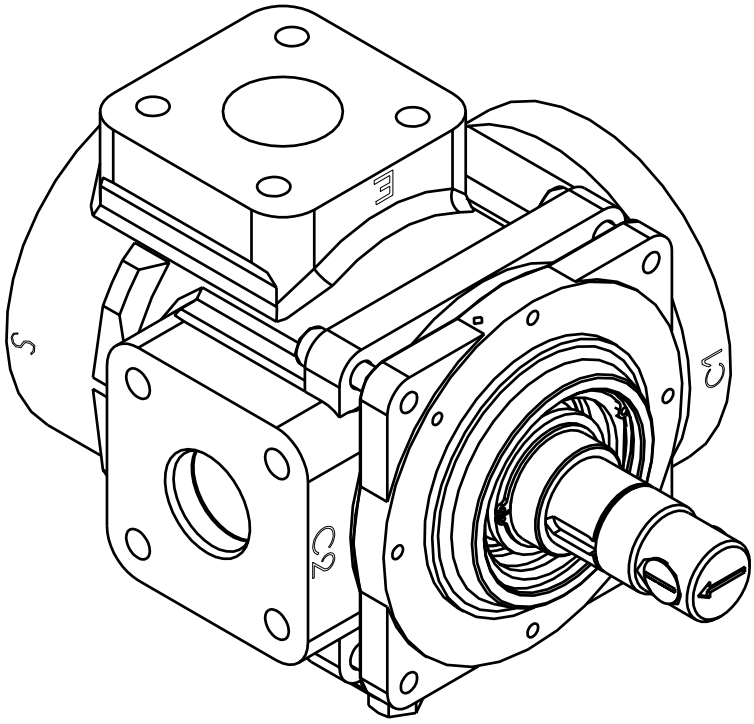


# CONTROL VALVES FOR GRINDER

Installation, Maintenance and
Operating Instructions
5 GA 71 en
Issue 5/02

metso
automation

## Table of Contents



**READ THESE INSTRUCTIONS FIRST!**

These instructions provide information about safe handling and operation of the unit.
If you require additional assistance, please contact Metso Automation or your authorized distributor or representative.

**SAVE THESE INSTRUCTIONS!**

# 1 OPERATION

## 1.1 General

The system comprises the equipment needed for controlling the hydraulic cylinders of pressure shoe and feed gate of the ginder. The control can be either manual or automatic.

The grinder operates in 5 phases:

Phase 1. "Grinding"
pressure shoe moves downwards
influenced by grinding pressure.

Phase 2. "Pressure shoe reversing"
fast movement

Phase 3. "Feed gate opening"

Phase 4. "Feed gate closing''

Phase 5. "Pressure shoe lowering"
fast movement

## 1.2 Main components

See Fig. 1.

Control valve of pressure shoe (GVA) with pneumatic actuator.

Control valve of feed gate cylinder (GVL) with pneumatic actuator.

Shut-off valve of grinding pressure water (SV) with pneumatic actuator.

Solenoid valves operating the above mentioned pneumatic actuators (SV1, SV2, SV3, SV4), Fig. 2.

Magnetic or inductive limit switches indicating limit positions of pressure shoe and feed gate.

## 1.3 Automatic operation

Starting position pressumed to be phase "grinding".

- When the pressure shoe comes to its lower position, the limit switch in question gives a signal - phase "pressure shoe reversing" follows.
- Pressure shoe comes to its upper position and the limit switch in question gives a signal.
  The operation continues on the condition that a simultaneous signal comes from the limit switch system in the conveyor system, indicating "logs on gate - gate may open". Phase "gate opening" follows and the logs fall into the piston pocket.
- After the feed gate has reached its open-position, the limit switch concerned gives a signal, phase "feed gate closing" follows.
- If the feed gate is not fully closed (e.g. logs between the gate and the grinder), the operation stops.
- If the gate closes, the limit switch in question gives a signal. Phase "pressure shoe lowering" follows (fast movement).At the same time the conveyor system receives a signal allowing a new log load to be transported on the gate.
- When the pressure shoe meets the logs in the piston pocket, the pressure in the cylinder increases until the pressure switch in the control panel gives a signal - phase "grinding".

## 1.4 Manual operation

The movement of pressure shoe and feed gate can be manually controlled, with the following exceptions, indipendently of each other, by means of the push buttons. For phase "grinding" there is no particular push buttons; grinding is switched on automatically when "pressure shoe lowering" control is on, by the signal from presure switch.

The manual operation circuit has the following lockings:

- The feed gate will not open if the grinding is switched on.
- The grinding cannot be switched on if the gate is open.

Valves GVL and GVA can, in emergency cases, be operated by placing a tool in the shaft bore and turning the valve shaft by hand. The plugs (29, 30) must be removed from the shaft bore first. The plugs must be-remounted immediately after the emergency operation, see Section 2.4.

**WARNING:**
**The bore in the shaft is for emergency operation only.** The bore must be fitted with plugs to meet the occupational safety requirements. There must not be an open bore in the shaft where a finger or a tool can be trapped.

## 1.5 "Release of pressure shoe" operation

When the system is in automatic operation and the phase "grinding", it is possible to create "release of pressure shoe" circuit by means of push button. The purpose of this is to eliminate the arching of logs in the piston pocket, which might stop the movement of the pressure shoe during "grinding" phase. This round is following: "pressure shoe reversing - pessure shoe lowering - grinding".

## 1.6 Operation of solenoid valves

See Fig. 2.

**Control of the gates**

A. Upper gate closed:
- a-coil energized, solenoid valve SV1 in position a
- GVL1 in position 1, upper gate closed

B. Upper gate open:
- b-coil energized, solenoid valve SV1 in position b
- GVL1 in position 2, upper gate open

A. Lower gate closed:
- a-coil energized, solenoid valve SV2 in position a
- GVL2 in position 1, lower gate closed

B. Lower gate open:
- b-coil energized, solenoid valve SV2 in position b
- GVL2 in position 2, lower gate open

**Control of the pressure shoe**

A. Pressure shoe up:
- solenoid valves SV3 and SV4 de-energized in position b

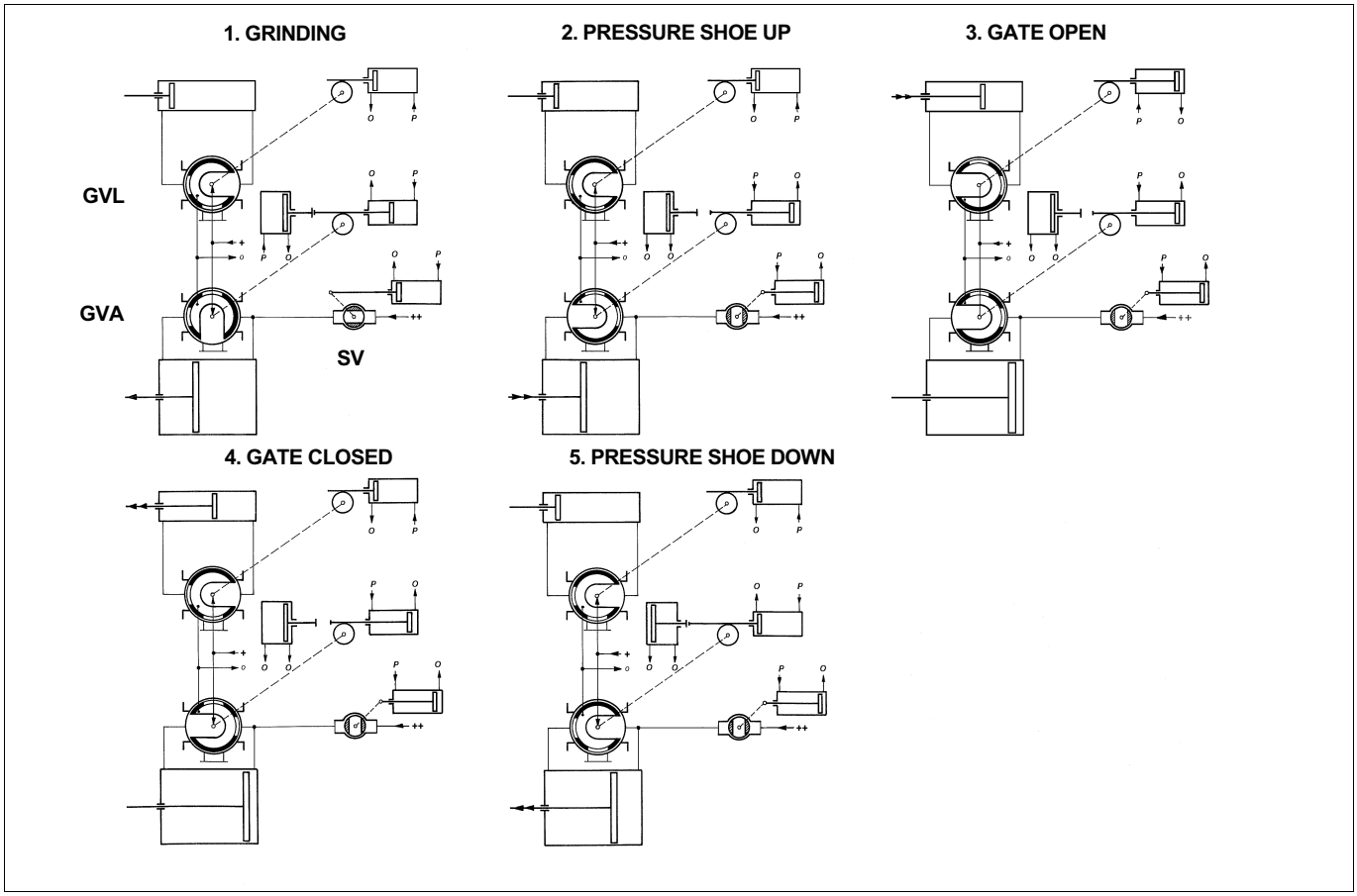



*Fig. 1. Hydraulic valves*

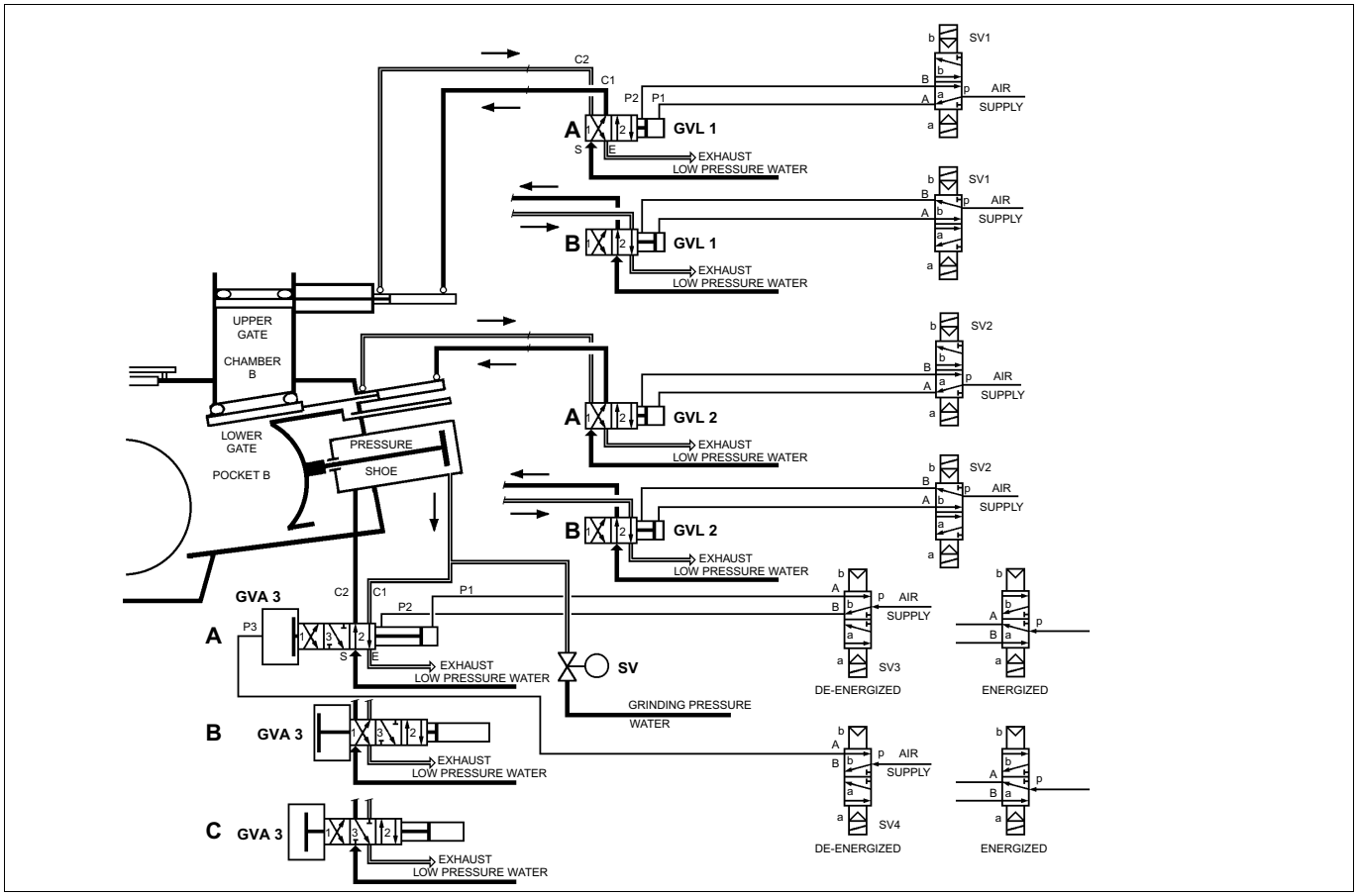



*Fig. 2. Solenoid valves*

- GVA3 in position 2
- pressure shoe up by low pressure water, SV is closed

B. Pressure shoe down:
- SV3 energized, solenoid valve changes to position a
- GVA3 changes to position 1
- pressure shoe down by low pressure water
- SV4 de-energized in position b and SV is closed

C. Grinding:
- SV3 remains energized
- SV4 energized and changes to position a. GVA3 changes to position 3
- SV will open and grinding pressure is on

# 2 MAINTENANCE

## 2.1 Valve GV652

The valve needs no regular maintenance.

### 2.1.1 Replacing of seat

Replacement of seat can be done without removing the actuator and while the valve is fastened to the piping system.

1. Open the socket head screws (21).
2. Lift off divider (2) and cover (3). Remove seal rings (8) (3 pcs.) and seal ring (9) with O-rings (14).
3. Remove bearing (10) if replacement is required.
4. Mount a new bearing (10) using a press.
5. Mount O-rings (14) over the neck of seal ring (8). Push seal rings with O-rings carefully into the body. Check that the sealing surface against divider is in the proper position.

**NOTE:**
The material of the O-ring (14) is EPDM, which doesn't tolerate mineral oil.

6. Mount O-rings (14) over the neck of seal ring (9). Push seal rings with O-rings carefully into the body
7. Mount divider (2) and cover (3) carefully into the body. Tighten the socket head screws (21). Remember O-ring (18).

### 2.1.2 Replacing of cover O-rings

**NOTE:**
In cover (3) there are two O-rings (15) and between these a groove and a drilling. If there is water coming from the drilling it means that the lowest O-ring is damaged.

1. Detach actuator (Section 2.3)
2. Remove gear wheel (7) and retaining ring (19). See assembly drawing for actuator, Section 3.4 or 3.5.
3. Detach socket head screws (21) and lift off cover (3). Leave divider (2) in place.
4. Change both O-rings (15).
5. Mount the cover (3). Don't forget the O-ring (18).
6. Mount the gear wheel (7) and retainer ring (18) back. See the assembly drawing in 3.4 or 3.5.
7. Assemble the actuator. Check the mounting position. See Section 2.3, phase 6.

## 2.2 Cylinder actuator GAL121 and GAA121

Actuator GAL121 for gate control valves, see 3.4.

Actuator GAA121 for pressure shoe control valves, see 3.5.

Actuators do not require no regular maintenance in normal circumstances. However, it would be beneficial to lubricate the support bearing (8), gear wheel (7) and gear rack (6) 3-4 times a year with oil, e.g. Mobil Vactra Oil No 2 or equivalent. The breather (19) must be detached during lubrication.

### 2.2.1 Changing of piston seal

1. Detach the actuator from the valve, see 2.3.
2. Open the screws (22) or (42) and detach the cylinder.
3. When changing the piston rings (11) or (36), renew the O-rings (12) or (37) also.
4. The seams of the piston rings should be as far as possible from each other. Use a special tool, see Fig. 3. Tighten the collar around the piston rings. Push the piston with rings through the collar into the cylinder.

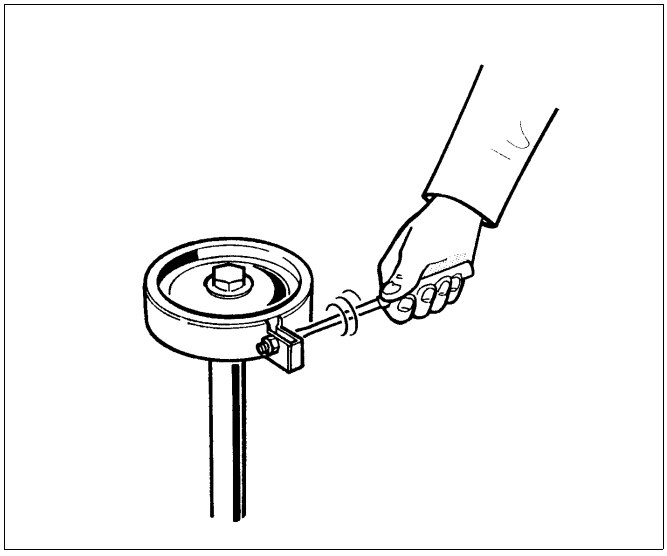


*Fig. 3. Using the special tool*

5. Check, that cylinder operates properly.
6. Fasten and tighten the screws (22) or (42).

### 2.2.2 Changing of piston rod seals

When changing the piston rings, renew also O-ring of the piston rod.

**Bigger cylinder GAA121**

1. Pull out the piston (32) and piston rod (34) with the cylinder (33).
2. Renew O-ring (39) and bearing (35).
3. Renew O-rings (40) if needed.
4. Mount the cylinder with piston back. Fasten and tighten the screws (42).

**Smaller cylinder GAA121 and cylinder GAL121**

1. Detach the piston (3) from the piston rod (5) by removing the screw (13).
2. Detach the cylinder base (2) by removing the screws (31).
3. Renew the O-ring (14) and bearing (10).
4. Renew the O-rings (16) if needed.
5. Mount the cylinder base (2). Remember to use seat rings (30) with the screws (31).
6. Fasten the piston (3) to the piston rod (5) with screw (13). Apply threadlock, e.g. Loctite 225 or equivalent. Tighten the screw (13).

## 2.3 Change of actuator mounting position

If the mounting position has to be changed, please note, that the position indication should always follow the position compared to valve body.

1. Operate the valve to the outer most position.
2. Open the fastening screws (20) and lift off the actuator without changing the position of the divider.
3. Apply new sealant, Loctite 573 or equivalent, between the valve body and actuator.
4. Mount the actuator into the correct position without changing the position of the gear rack.
5. Fasten screws (20).
6. Check, that the pointer (52) is in the correct position compared the valve. If needed, remove screws (53) and turn the pointer 180 degrees. Fasten the pointer (52) with screws (53).

**WARNING:**
**The pointer (52) must be in a position where the text "S->C2, C1->E" is aligned with the port C2.**
The pointer should always show the phase of grinding. If the pointer is in a wrong position, i.e. it has not been turned during mounting position change, there is a safety risk.

The drawings show the actuator rotated 180 degrees (position "A" or "B"). If needed, the actuator can be rotated 90 degrees as well using procedures described ealier. Also in this case take care of the position indication. The pointer must be in a position where the text "S->C2, C1->E" is aligned with the port C2.

## 2.4 Shaft protection

See assembly drawing, Section 3.1, 3.2 or 3.3.

**WARNING:**
**The bore in the shaft is for emergency operation only.**
The bore must be fitted with plugs to meet the occupational safety requirements. There must not be an open bore in the shaft where a finger or a tool can be trapped.

1. Install the plug (30) in the shaft bore so, that the groove in the plug is aligned with the arrow in the shaft end. This way the plug serves as a position indicator also.
2. Install the plug (29) in the shaft bore.
3. Fasten the parts with screw (31).

## 2.5 Updating series GV651 valves

The old series GV651 valves can be updated to meet today's occupational safety requirements . There must not be an open bore in the shaft where a finger or a tool can be trapped. Also flat end shafts are not allowed to prevent the use of a wrench.

### 2.5.1 Shaft end protection

See figure in Section 3.7.

1. Install the plug (30) in the shaft bore so, that the groove in the plug is aligned with the arrow in the shaft end. This way the plug serves as a position indicator also.
2. Install the plug (29) in the shaft bore.
3. Fasten the parts with screw (31).

## 2.6 Pointer mounting

See figure in Section 3.7.

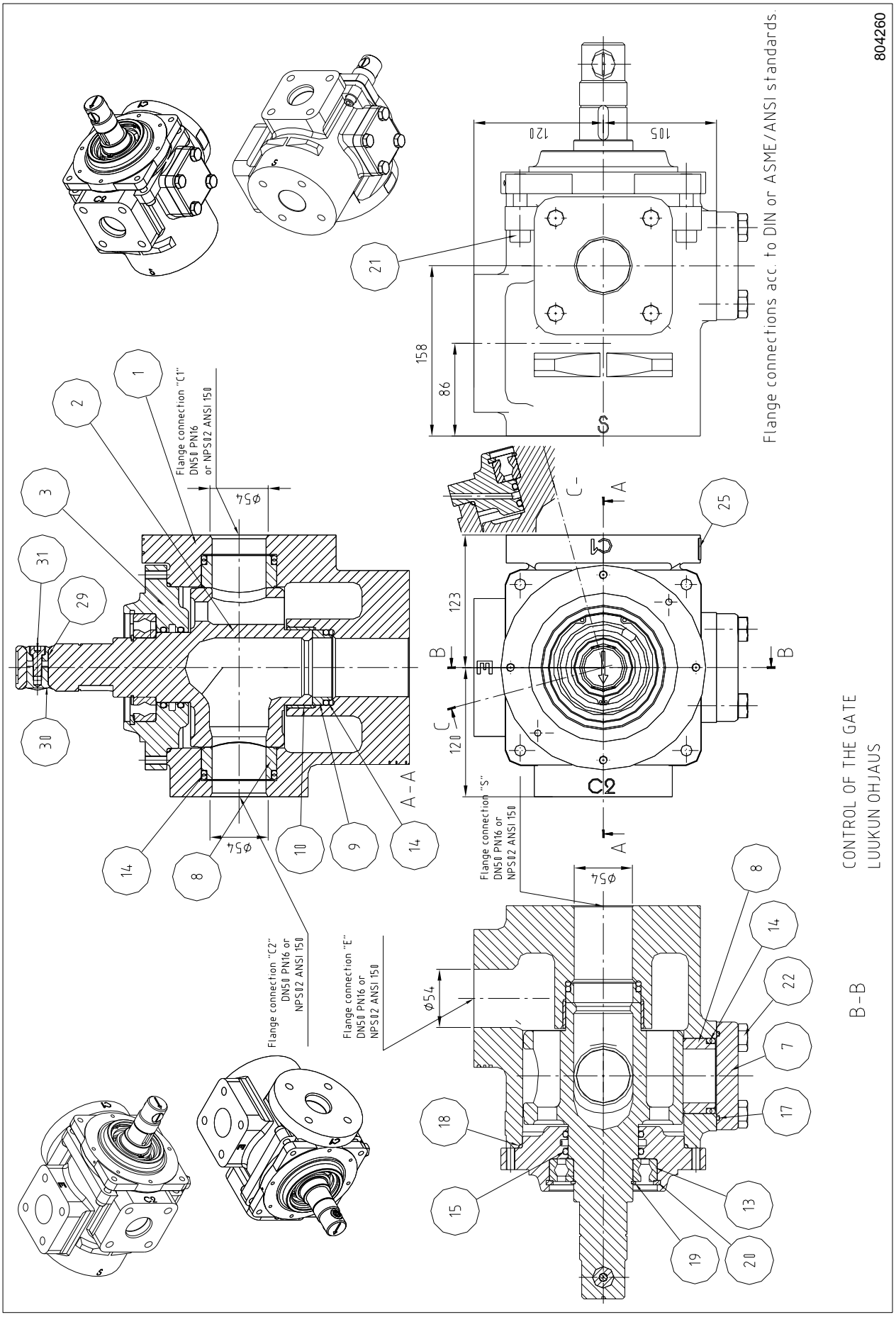
1. Two bores with M5 thread for mounting screws (53) are needed in the actuator housing (thread depth 7 mm, drilling depth 10 mm).
2. Fix the pointer (52) with screws (53) in the correct position. The pointer must be in a position where the text "S->C2, C1->E" is aligned with the port C2.

# 3 RECYCLING AND DISPOSAL OF A REJECTED VALVE

Most valve parts can be recycled if sorted according to material. Most parts have material marking. A material list is supplied with the valve. In addition, separate recycling and disposal instructions are available from the manufacturer. A valve can also be returned to the manufacturer for recycling and disposal against a fee.

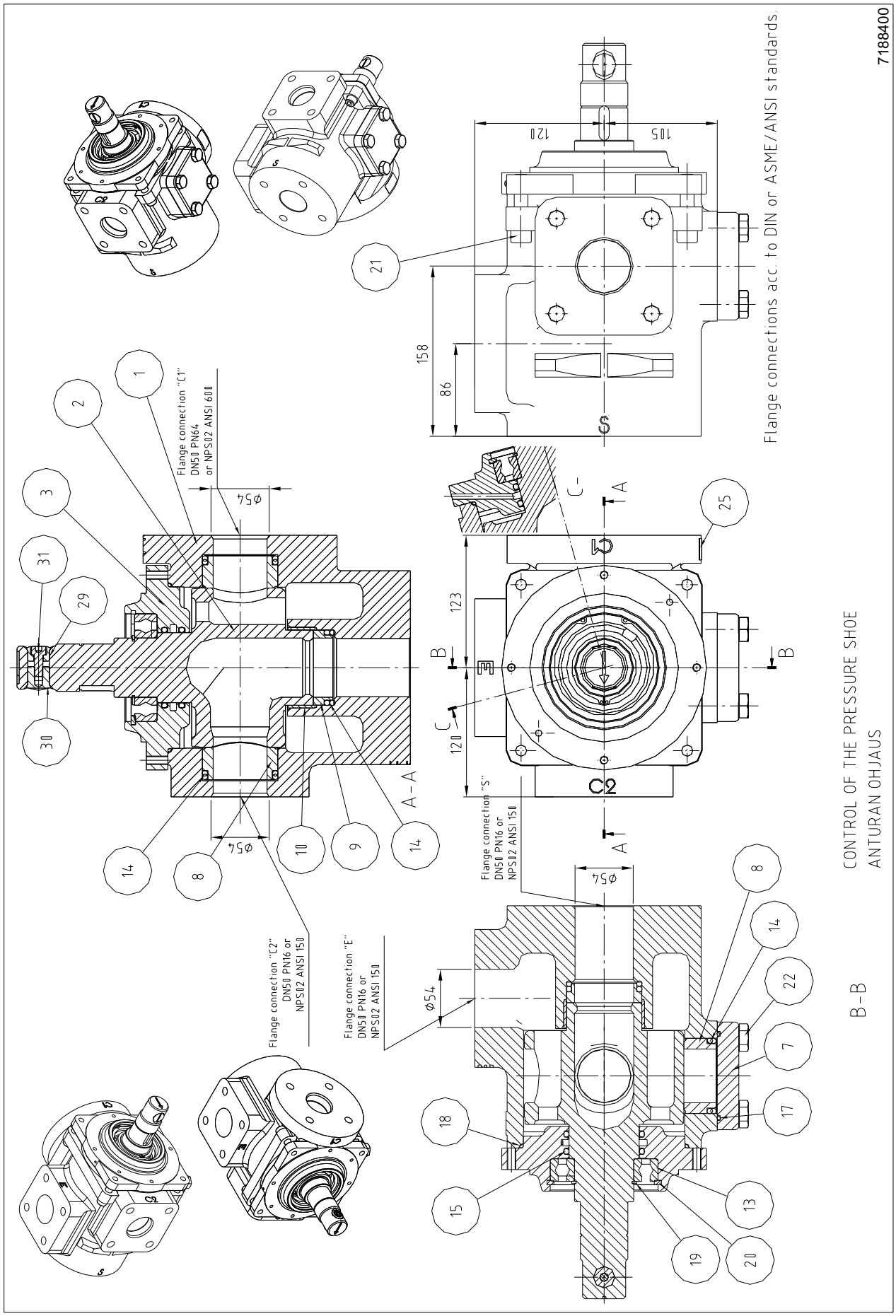
# 4 DRAWINGS AND PART LISTS

## 4.1 Grinder control valve, GV652



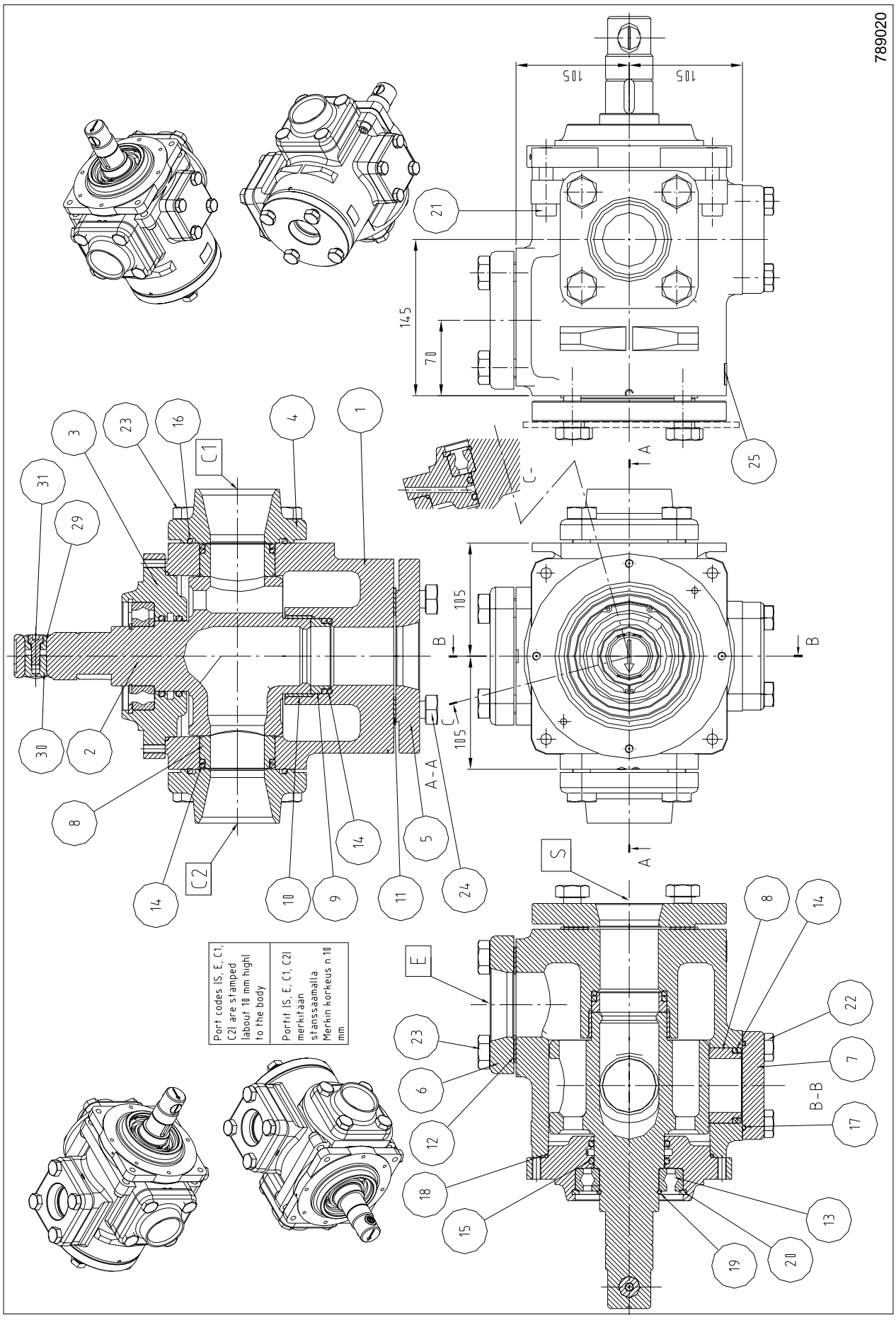
| Part | Qty | Description |
|---|---|---|
| 001 | 1 | Body |
| 002 | 1 | Divider |
| 003 | 1 | Bonnet |
| 007 | 1 | Flange |
| 008 | 3 | Seal ring |
| 009 | 1 | Seal ring |
| 010 | 1 | Bearing |
| 013 | 1 | Ball bearing |
| 014 | 8 | O-ring |
| 015 | 2 | O-ring |
| 017 | 1 | O-ring |
| 018 | 1 | O-ring |
| 019 | 1 | Snap ring |
| 020 | 1 | Snap ring |
| 021 | 4 | Socket head screw |
| 022 | 4 | Hexagon screw |
| 022 | 4 | Hexagon screw |
| 025 | 1 | Identification plate |
| 029 | 1 | Plug |
| 030 | 1 | Plug |
| 031 | 1 | Socket head screw |

## 4.2 Grinder control valve, GV652



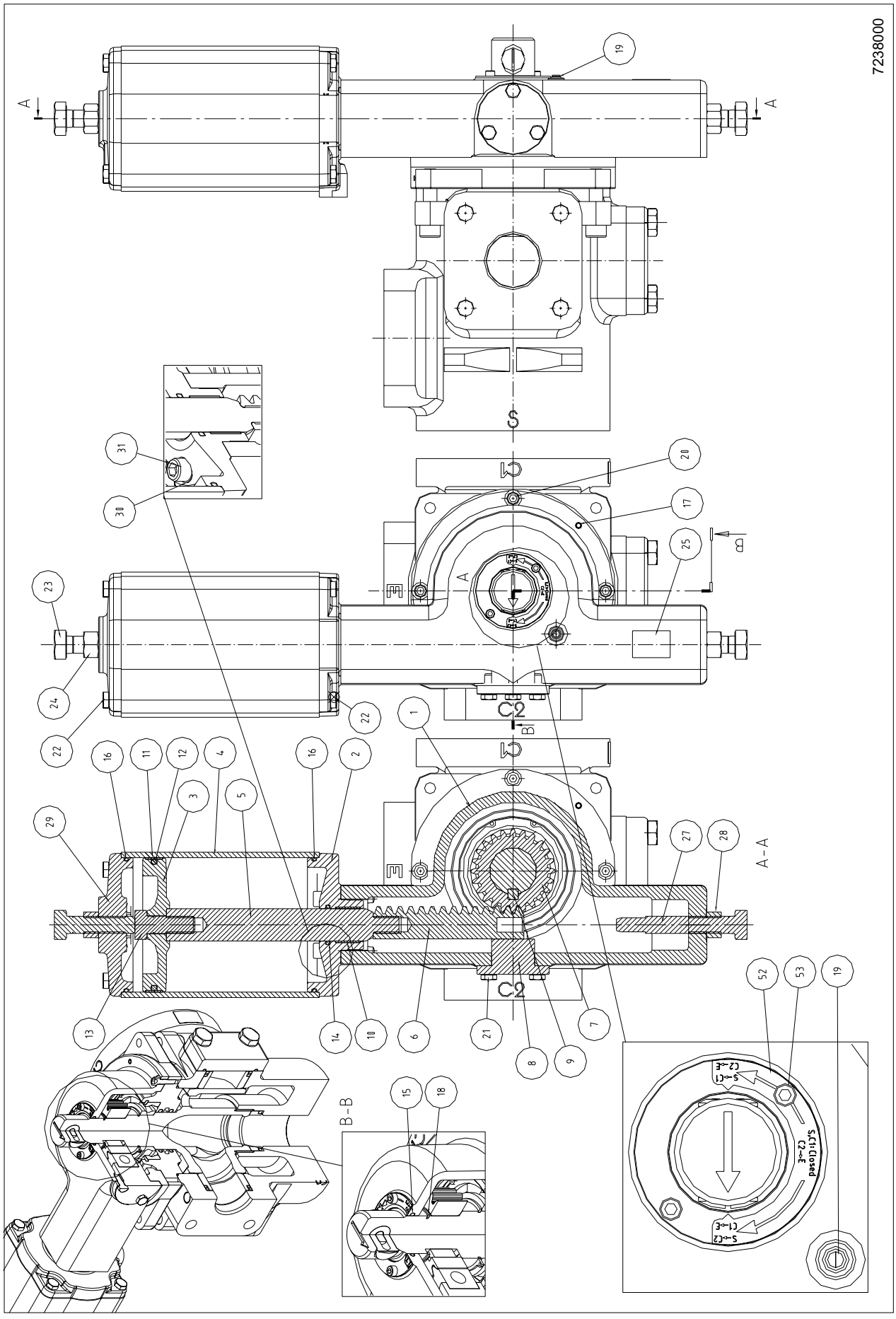
| Part | Qty | Description |
|---|---|---|
| 001 | 1 | Body |
| 002 | 1 | Divider |
| 003 | 1 | Bonnet |
| 007 | 1 | Flange |
| 008 | 3 | Seal ring |
| 009 | 1 | Seal ring |
| 010 | 1 | Bearing |
| 013 | 1 | Ball bearing |
| 014 | 8 | O-ring |
| 015 | 2 | O-ring |
| 017 | 1 | O-ring |
| 018 | 1 | O-ring |
| 019 | 1 | Snap ring |
| 020 | 1 | Snap ring |
| 021 | 4 | Socket head screw |
| 022 | 4 | Hexagon screw |
| 022 | 4 | Hexagon screw |
| 025 | 1 | Identification plate |
| 029 | 1 | Plug |
| 030 | 1 | Plug |
| 031 | 1 | Socket head screw |

## 4.3 Grinder controls valve, GV652Y



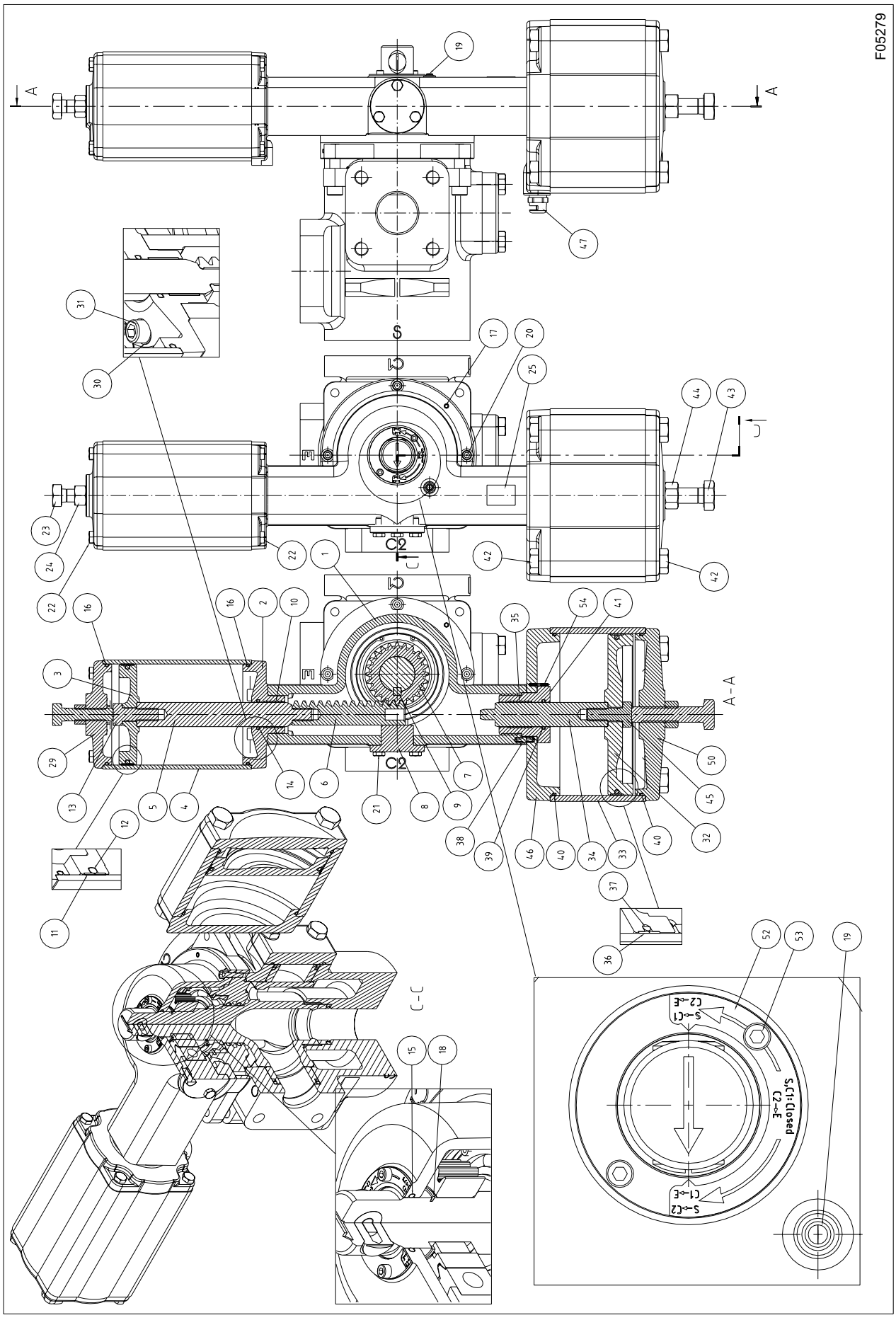
| Part | Qty | Description |
|---|---|---|
| 001 | 1 | Body |
| 002 | 1 | Divider |
| 003 | 1 | Bonnet |
| 007 | 1 | Flange |
| 008 | 3 | Seal ring |
| 009 | 1 | Seal ring |
| 010 | 1 | Bearing |
| 013 | 1 | Ball bearing |
| 014 | 8 | O-ring |
| 015 | 2 | O-ring |
| 017 | 1 | O-ring |
| 018 | 1 | O-ring |
| 019 | 1 | Snap ring |
| 020 | 1 | Snap ring |
| 021 | 4 | Socket head screw |
| 022 | 4 | Hexagon screw |
| 023 | 12 | Hexagon screw |
| 024 | 4 | Hexagon screw |
| 025 | 1 | Identification plate |
| 029 | 1 | Plug |
| 030 | 1 | Plug |
| 031 | 1 | Socket head screw |

## 4.4 Actuator GAL121



| Part | Qty | Description |
|---|---|---|
| 001 | 1 | Housing |
| 002 | 1 | Cylinder base |
| 003 | 1 | Piston |
| 004 | 1 | Cylinder pipe |
| 005 | 1 | Piston rod |
| 006 | 1 | Gear rack |
| 007 | 1 | Gear wheel |
| 008 | 1 | Support bearing |
| 009 | 1 | Key |
| 010 | 1 | Bearing strip |
| 011 | 2 | Piston ring |
| 012 | 1 | O-ring |
| 013 | 1 | Hexagon screw |
| 014 | 1 | O-ring |
| 015 | 1 | O-ring |
| 016 | 2 | O-ring |
| 017 | 1 | Spring pin |
| 018 | 1 | Retainer ring |
| 019 | 1 | Breather |
| 020 | 3 | Socket head screw |
| 021 | 3 | Hexagon screw |
| 022 | 8 | Hexagon screw |
| 023 | 1 | Limit screw |
| 024 | 1 | Hexagon nut |
| 025 | 1 | Identification plate |
| 027 | 1 | Limit screw |
| 028 | 1 | Hexagon nut |
| 029 | 1 | Cylinder end |
| 030 | 4 | Seat ring |
| 031 | 4 | Socket head screw |
| 052 | 1 | Pointer |
| 053 | 1 | Socket head screw |

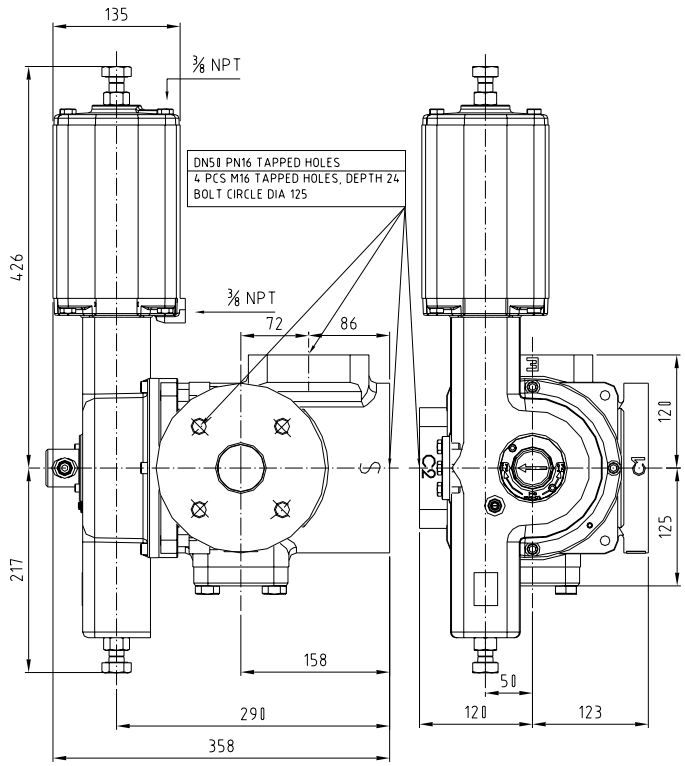
## 4.5 Actuator GAA121



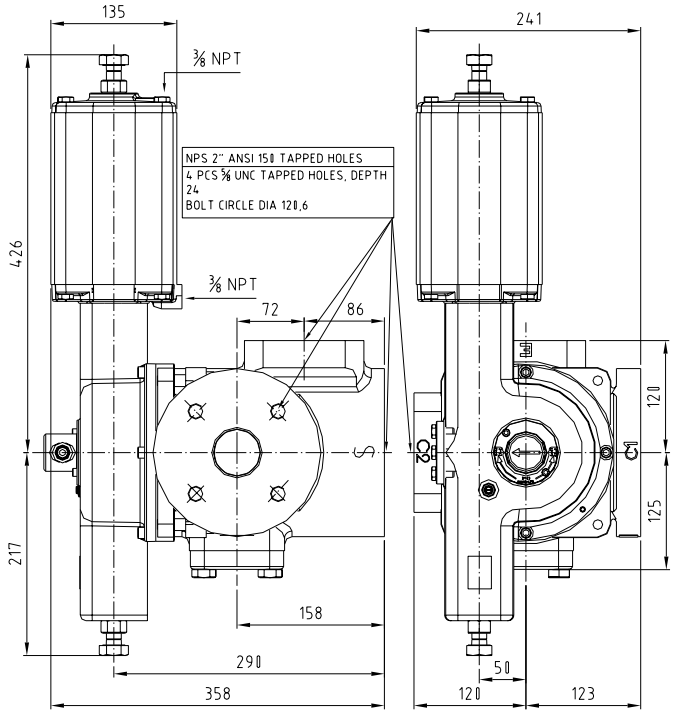
| Part | Qty | Description |
|---|---|---|
| 001 | 1 | Housing |
| 002 | 1 | Cylinder base |
| 003 | 1 | Piston |
| 004 | 1 | Cylinder pipe |
| 005 | 1 | Piston rod |
| 006 | 1 | Gear rack |
| 007 | 1 | Gear wheel |
| 008 | 1 | Support bearing |
| 009 | 1 | Key |
| 010 | 1 | Bearing strip |
| 011 | 1 | Piston ring |
| 012 | 1 | O-ring |
| 013 | 1 | Hexagon screw |
| 014 | 1 | O-ring |
| 015 | 1 | O-ring |
| 016 | 2 | O-ring |
| 017 | 1 | Spring pin |
| 018 | 1 | Retainer ring |
| 019 | 1 | Breather |
| 020 | 3 | Socket head screw |
| 021 | 3 | Hexagon screw |
| 022 | 8 | Hexagon screw |
| 023 | 1 | Limit screw |
| 024 | 1 | Hexagon nut |
| 025 | 1 | Identification plate |
| 029 | 1 | Cylinder end |
| 030 | 4 | Seat ring |
| 031 | 4 | Socket head screw |
| 032 | 1 | Piston |
| 033 | 1 | Cylinder pipe |
| 034 | 1 | Piston rod |
| 035 | 1 | Bearing |
| 036 | 2 | Piston ring |
| 037 | 1 | O-ring |
| 038 | 1 | Spring pin |
| 039 | 1 | O-ring |
| 040 | 2 | O-ring |
| 041 | 1 | Bushing |
| 042 | 8 | Hexagon screw |
| 043 | 1 | Limit screw |
| 044 | 1 | Hexagon nut |
| 045 | 1 | Hexagon screw |
| 046 | 1 | Cylinder base |
| 047 | 1 | Filter |
| 050 | 1 | Cylinder end |
| 052 | 1 | Pointer |
| 053 | 2 | Socket head screw |
| 054 | 1 | Spring pin |

## 4.6 Dimensional drawings

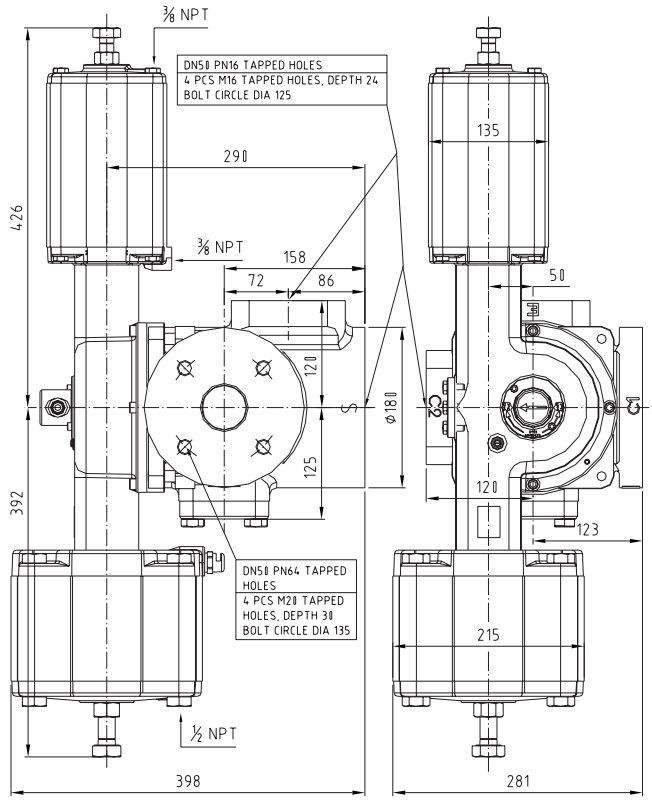
### 4.6.1 GV652LK-GAL121 Position "A" (DIN flanges)




### 4.6.2 GV652LC-GAL121 Position "A" (ANSI/ASME flanges)



## 4.6.3 GV652AK-GAA121 Position "A" (DIN flanges)

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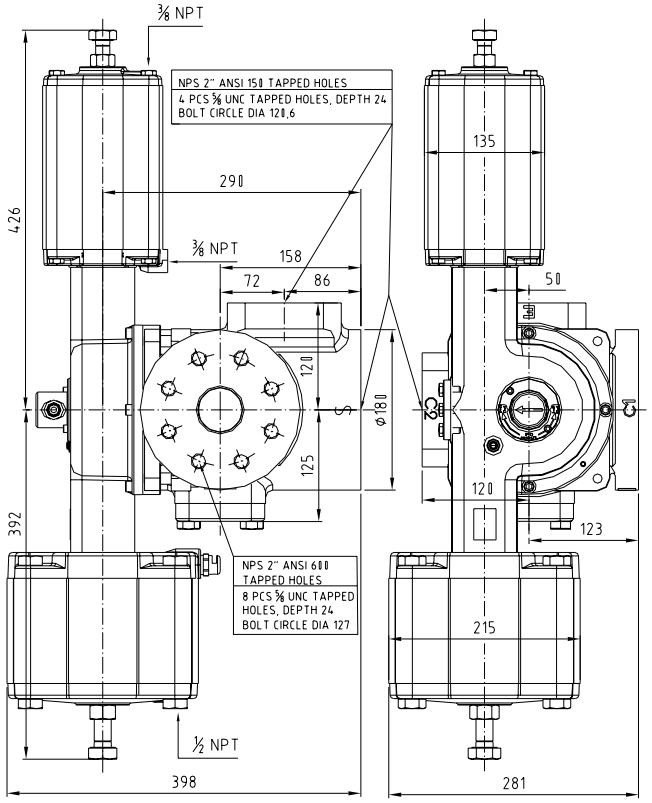
## 4.6.4 GV652AC-GAA121 Position "A" (ANSI/ASME flanges)

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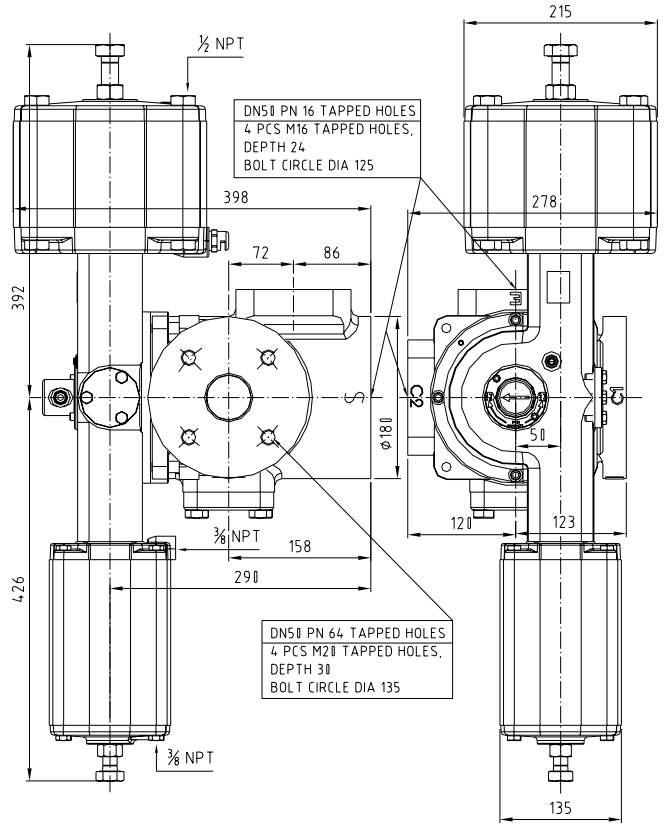
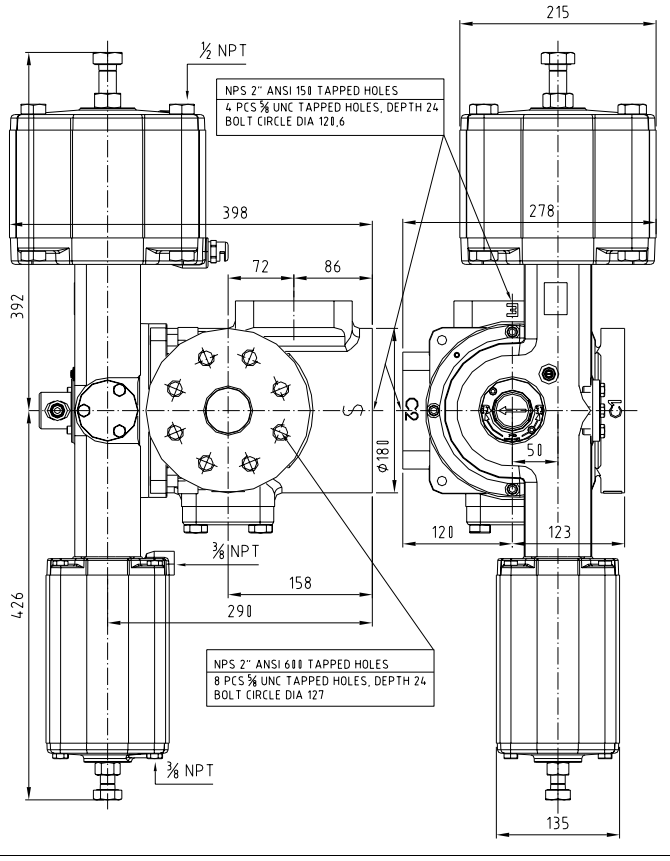
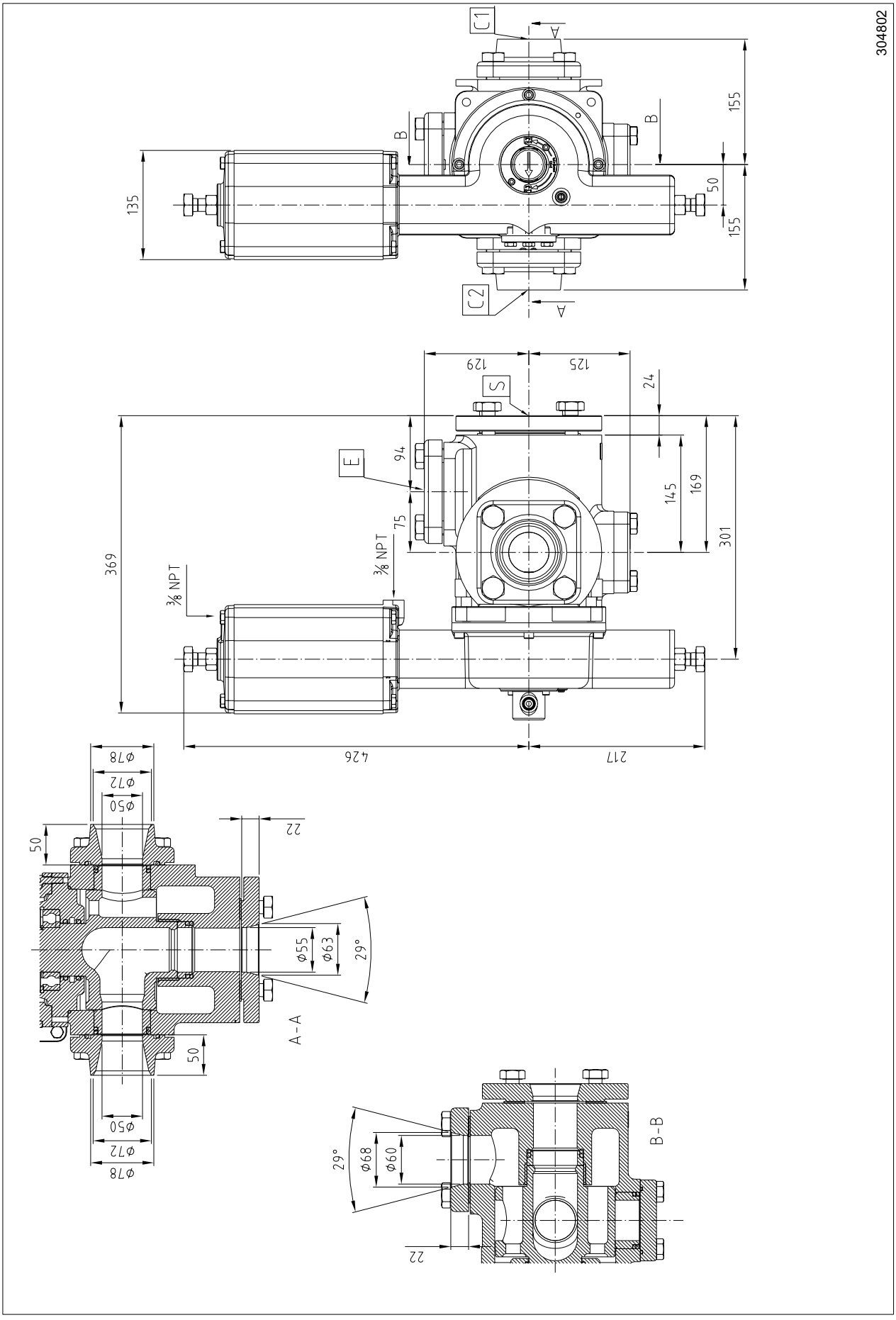
### 4.6.5 GV652AK-GAA121
### Position "B" (DIN flanges)



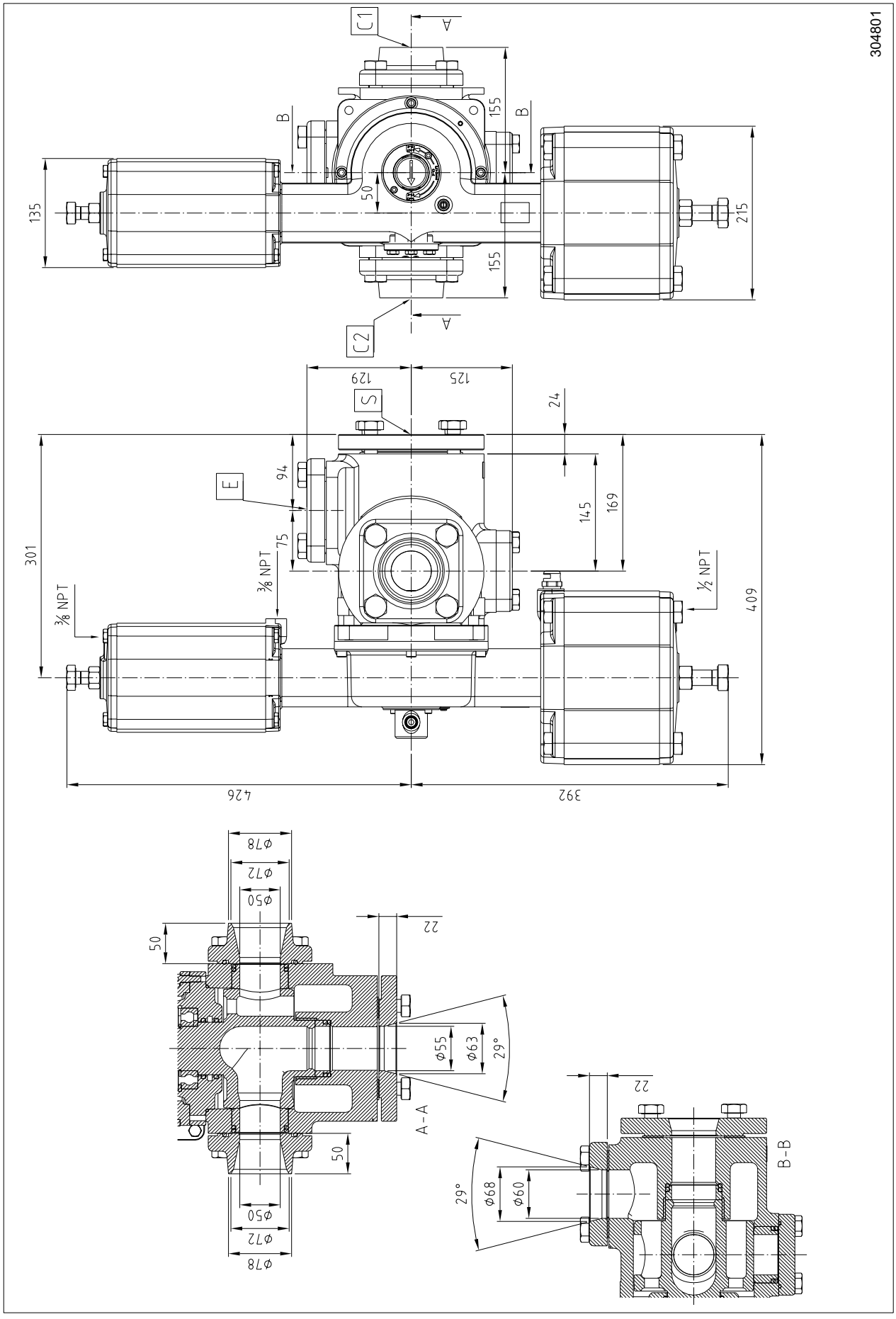

### 4.6.6 GV652AC-GAA121
### Position "B" (ANSI/ASME flanges)



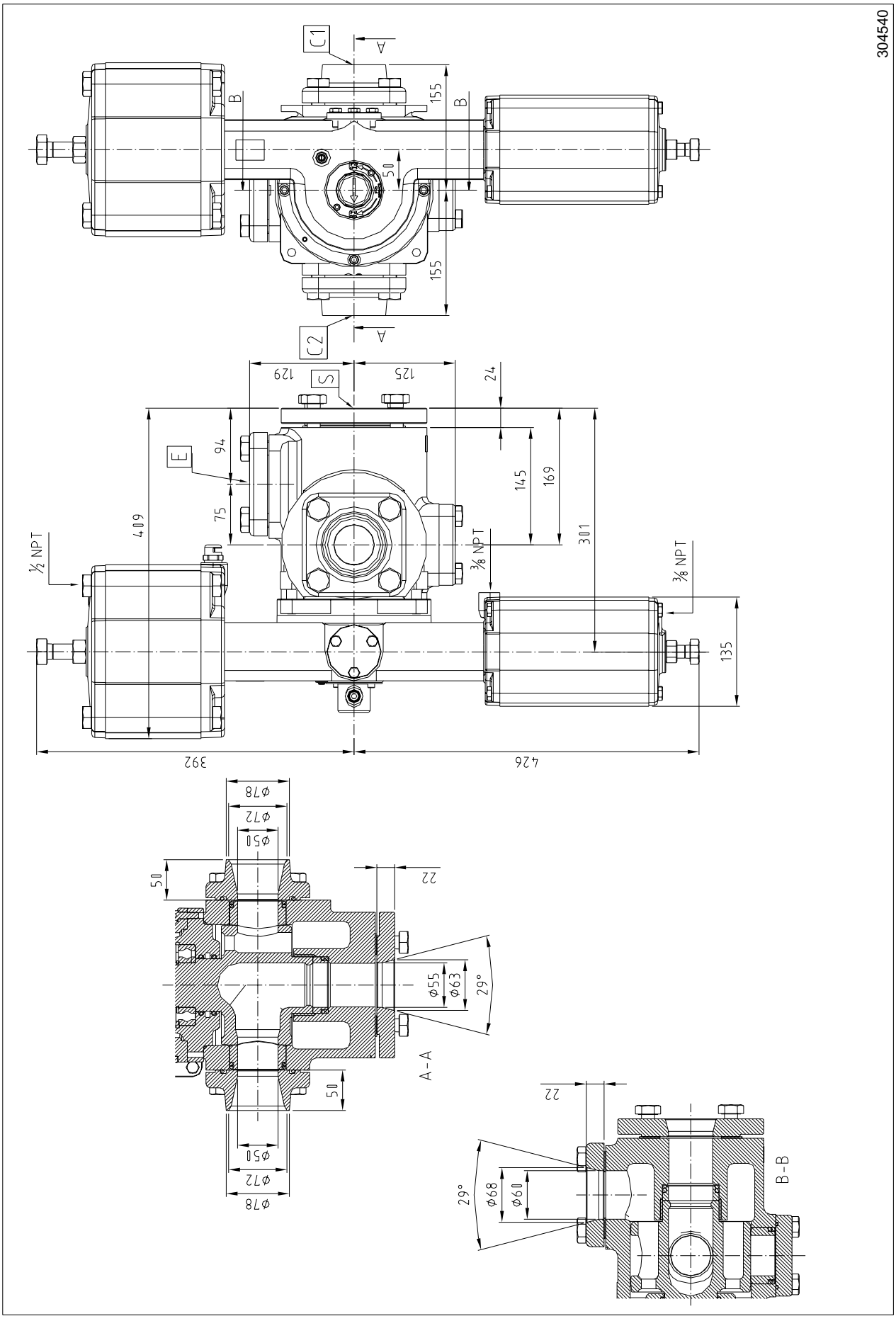
### 4.6.7 GV652Y-GAL121
### Position "A" (Y = weld flanges)



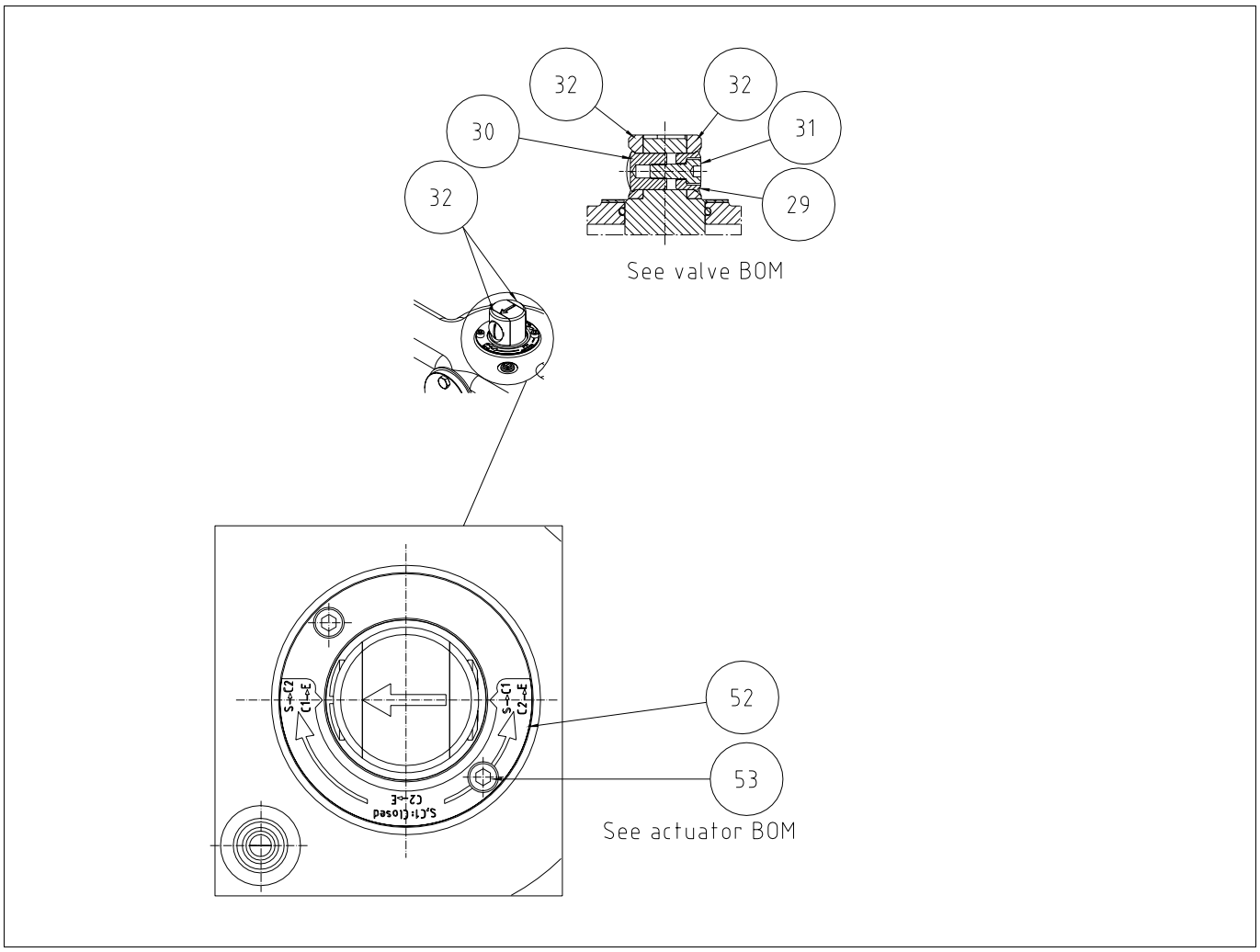
### 4.6.8 GV652Y-GAA121
### Position "A" (Y=weld flanges)



### 4.6.9 GV652Y-GAA121
### Position "B" (Y=weld flanges)



## 4.7 GV651 valve update




| Part | Qty | Description |
|---|---|---|
| 29 | 1 | Plug |
| 30 | 1 | Plug |
| 31 | 1 | Socket head screw |
| 32 | 1 | Protective plate |

# 5 TYPE CODING

## *VALVE*

| 1. | 2. | 3. |
|---|---|---|
| GV | 652 | AK |

| 1. sign | PRODUCT GROUP |
|---|---|

| 2. sign | PIPE SIZE AND VALVE TYPE |
|---|---|

| 3. sign | APPLICATION AND SUITABLE FLANGE DRILLING |
|---|---|
| AK | Pressure shoe actuation, for flange drilling PN 16/64 |
| AC | Pressure shoe actuation, for flange drilling ANSI 150/600 |
| LK | Gate actuation, for flange drilling PN 16 |
| LC | Gate actuation, for flange drilling ANSI 150 |
| Y | Pressure shoe and gate actuation, weld ends, suitable for all pressure classes, dimensions same as for GV 651 |

## *ACTUATOR*

| 1. | 2. | 3. |
|---|---|---|
| GA | A | 121 |

| 1. sign | PRODUCT GROUP |
|---|---|

| 2. sign | APPLICATION |
|---|---|
| A | Pressure shoe actuation |
| L | Gate actuation |

| 3. sign | ACTUATOR SIZE AND TYPE |
|---|---|

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