

# Atlas Copco Stationary Air Compressors

ZT110-132-145-160-200-250-275

## Instruction Book

For units with Elektronikon® regulator, this book must be used together with the "User manual for Elektronikon® regulator", printed matter no. 2920 1291 0x.

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- This instruction book meets the requirements for instructions specified by the machinery directive 98/37/EC and is valid for CE as well as non-CE labelled machines

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**Atlas Copco**

This instruction book describes how to handle and operate the subject machine(s) to ensure safe operation, optimum working economy and long service life.

**Read this book before putting the machine into operation** to ensure correct handling, operation and proper maintenance from the beginning. The maintenance schedule comprises measures for keeping the compressor in good repair.

Keep the book available for the operator(s) and make sure that the compressor is operated and that maintenance is carried out according to the instructions. Record all operating data, maintenance work effected, etc. in an operator's logbook available from Atlas Copco. Follow all applicable safety precautions, amongst others those mentioned in this book.

Repairs must be carried out by trained personnel from Atlas Copco who can also be contacted for any further information.

In all correspondence mention the type and the serial number, shown on the data plate.

**The company reserves the right to make changes without prior notice.**

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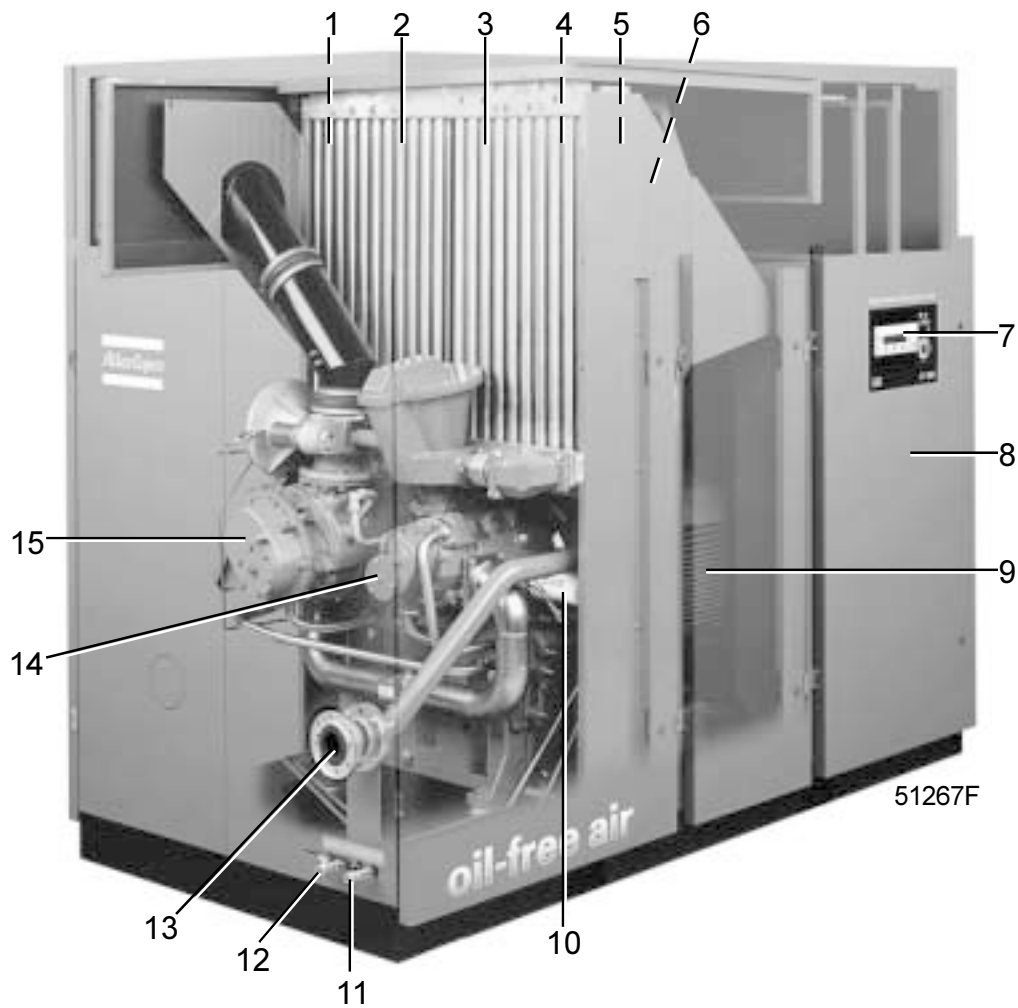
# 1 LEADING PARTICULARS

## 1.1 General description

ZT110 up to ZT275 are two-stage, electric motor driven screw compressors, which deliver oil-free, pulsation-free air. The compressors are air-cooled.

ZT compressors are enclosed in a sound-insulated bodywork and include mainly (Fig. 1.1):

- Air filter (6)
- Low-pressure compressor element (15)
- Pre-intercooler (2) and intercooler (1)
- High-pressure compressor element (14)
- Pre-aftercooler (3) and aftercooler (4)
- Cooling fan (5)
- Electric motor (9)
- Drive coupling
- Gear casing
- Elektronikon® (7) or Electropneumatic control system
- Safety valves



- |   |                 |    |                               |    |                                  |
|---|-----------------|----|-------------------------------|----|----------------------------------|
| 1 | Intercooler     | 7  | Elektronikon regulator        | 12 | Condensate valve, intercooler    |
| 2 | Pre-intercooler | 8  | Electrical cabinet            | 13 | Air outlet                       |
| 3 | Pre-aftercooler | 9  | Drive motor                   | 14 | High-pressure compressor element |
| 4 | Aftercooler     | 10 | Oil filter                    | 15 | Low-pressure compressor element  |
| 5 | Fan             | 11 | Condensate valve, aftercooler |    |                                  |
| 6 | Air filter      |    |                               |    |                                  |

Fig. 1.1 General view

### 1.1.1 Drive arrangements

#### Arr. E

The motor is flanged to the gear casing by means of a coupling housing. The motor/gear casing unit is supported on the frame by vibration dampers.

#### Arr. 1

The motor is mounted on a separate subframe. The subframe and gear casing are supported on the frame by vibration dampers.

### 1.1.2 Control systems

#### Elektronikon control system (see section 1.2)

The compressors are controlled by an electronic regulator which:

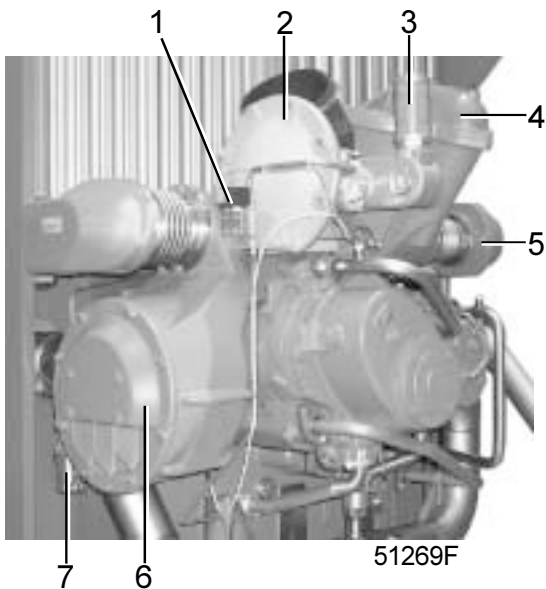
- controls the operation of the compressor
- reduces the power consumption
- warns the operator in case of an abnormal operating condition
- protects the compressor
- monitors components subject to service
- automatically restarts the compressor after voltage failure

The regulator is provided with a control panel fitted in the door of the electric cabinet. The panel has a display indicating messages concerning the compressor operating condition, a service need or a possible fault.

#### Electropneumatic control system (see section 1.3)

As an option, the compressors may be controlled by an electropneumatic regulator which:

- controls the operation of the compressor
- protects the compressor



- 1 Loading solenoid valve
- 2 Full-load/no-load valve
- 3 Silencer
- 4 High-pressure silencer
- 5 Check valve
- 6 Low-pressure silencer
- 7 Breather

Fig. 1.2 Side view



- 1 Air outlet
- 2 Condensate drain, aftercooler
- 3 Automatic condensate outlet, aftercooler
- 4 Condensate drain, intercooler
- 5 Automatic condensate outlet, intercooler

Fig. 1.3 Air and condensate connections

The relay-controlled regulator is provided with a control panel fitted in the door of the electric cabinet. The panel has LEDs indicating a possible fault.

An instrument panel with pressure and temperature gauges is also provided.

## 1.2 Elektronikon® control system

### 1.2.1 Elektronikon regulator (Fig. 1.4)

#### 1.2.1.1 Automatic control of compressor operation

The regulator maintains the net pressure between programmable limits by automatically loading and unloading the compressor. A number of programmable settings, e.g. the unloading and loading pressures, the minimum stop time and the maximum number of motor starts are taken into account.

The regulator stops the compressor whenever possible to reduce the power consumption and restarts it automatically when the net pressure decreases. In case the expected unloading period is too short, the compressor is kept running to prevent too-short standstill periods.

**Warning** *A number of time-based automatic start/stop commands may be programmed 1). Take into account that a start command will be executed (if programmed and activated), even after manually stopping the compressor.*

#### 1.2.1.2 Protecting the compressor

##### Shut-down

The compressor will be shut down if:

- the motor current exceeds the permissible maximum
- the air outlet temperature of the low- or high-pressure compressor element exceeds the pre-set value
- the air inlet temperature of the high-pressure compressor element exceeds the pre-set value
- the oil temperature exceeds the pre-set value
- the oil pressure drops below the pre-set value

Remedy the trouble and reset the message on display (4-Fig. 1.4) before restarting. See "User manual for Elektronikon® regulator", section "Status data submenu".

##### Shut-down warning

Before any shut-down level is reached, except for the motor overload, a message will appear on display (4-Fig. 1.4) and general alarm LED (3) will light up, to warn the operator that the shut-down warning level is exceeded. The shut-down warning level is a programmable setting below the shut-down level.

The message disappears as soon as the cause of the trouble is remedied.

### 1.2.1.3 Monitoring components subject to service

The regulator continuously monitors the oil, motor grease, oil filters and air filters. Each input is compared to programmed time intervals or pressure drops. If these limits are exceeded, a message will appear on display (4-Fig. 1.4) to warn the operator to replace the indicated component, to change the oil or to grease the motor as the case may be.

### 1.2.1.4 Automatic restart after voltage failure

For compressors leaving the factory, this function is made inactive. If desired, the function can be activated. Consult Atlas Copco.

**Warning** *If activated and provided the regulator was in the automatic operation mode and the compressor control mode (local, remote 1 or remote 2 - see section 1.2.3) was not changed during the voltage failure, the compressor will automatically restart if the supply voltage to the module is restored within a programmed time period (this time period is called the **power recovery time**).*

*The power recovery time can be set between 1 and 254 seconds or to 0. If the power recovery time is set to 0, the compressor will always restart after a voltage failure, no matter how long it takes to restore the voltage.*

### 1.2.2 Control panel (Fig. 1.4)

#### Indicators, keys and buttons

- 1 Automatic operation LED  
Indicates that the electronic regulator is automatically controlling the compressor: the compressor is loaded, unloaded, stopped and restarted depending on the air consumption and the limitations programmed in the regulator.
- 2 Voltage on LED  
Indicates that the voltage is switched on.
- 3 General alarm LED  
Is alight if a shut-down warning condition exists. See section 1.2.1.

Blinks if a shut-down condition exists, if a sensor used to protect the compressor is out of order or after an emergency stop. See section 1.2.1.

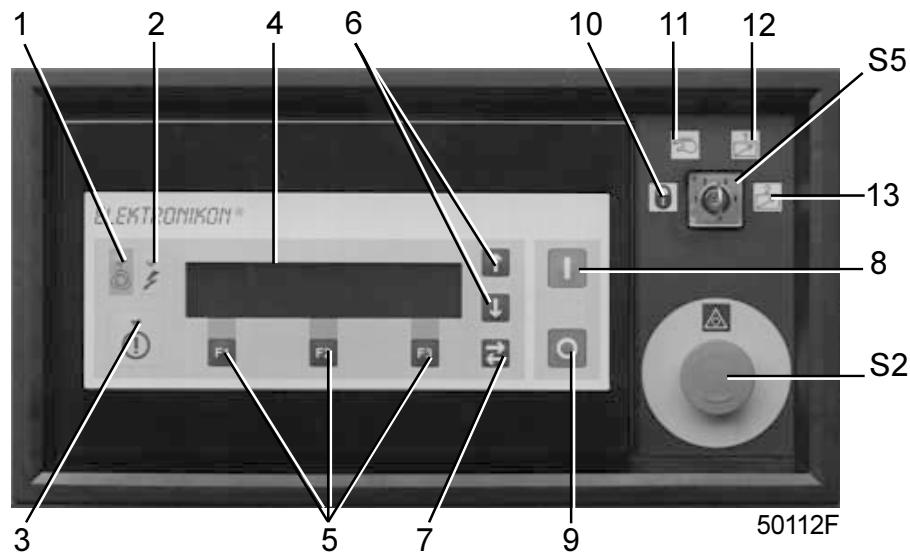


Fig. 1.4 Control panel for ZT with Elektronikon regulator

#### Indicators, keys and buttons

- 4 Display  
Indicates messages concerning the compressor operating condition, a service need or a fault. See "User manual for Elektronikon® regulator", sections "Status data submenu" and "Service submenu".
- 5 Function keys  
Keys to control and program the compressor. See below.
- 6 Scroll keys  
Keys to scroll through the display.
- 7 Tabulator key  
Key to go to the next field of the display.
- 8 Start button  
Push button to start the compressor. LED (1) lights up indicating that the electronic regulator is operative (in automatic operation). The LED goes out after unloading the compressor manually.
- 9 Stop button  
Push button to stop the compressor. LED (1) goes out. The compressor will run unloaded for 3 seconds before stopping.

#### Indicators, keys and buttons

- S2 Emergency stop button  
Push button to stop the compressor immediately in case of emergency. After remedying the trouble, unlock the button by pulling it out.
- S5 Control mode switch  
Key switch to select the compressor control modes. See section 1.2.3.

#### Selecting a menu

To facilitate controlling the compressor, menu-driven programs are implemented in the electronic regulator. Use the function keys (5) to select the menus in order to program and monitor the compressor. The "User manual for Elektronikon® regulator" deals elaborately with all regulator functions.

#### Function keys

The functions of the keys vary depending on the displayed menu. The actual function is indicated just above the relevant key. The most common functions are listed below:

Compressor outlet	7.5 bar
Oil	2.1 bar
Automatically Loaded	
Menu	Show More Unload
F1	F2 F3

Fig. 1.5 Example of the main display

Status data			↓
Main Screen	Select		
F1	F2	F3	

Fig. 1.6 Example of a main menu

Designation (4-Fig. 1.4)	Function
Add	To add compressor start/stop commands (day/hour)
Cancel	To cancel a programmed setting when programming parameters
Delete	To delete compressor start/stop commands
Limits	To show limits for a programmable setting
List	To list programmed start/stop commands (day/hour)
Load	To load the compressor manually
Main Screen	To return from a menu to the main display (Fig. 1.5)
Menu	Starting from the main display (Fig. 1.5), to initiate the main menu (Fig. 1.6) which gives access to submenus Starting from a submenu, to return to the main menu (Fig. 1.6)
Modify	To modify programmable settings
Show More	To have a quick look at the compressor status
Program	To program modified settings
Reset	To reset a timer or message
Return	To return to a previously shown option or menu
Select	To select a submenu or to read more details of a selection shown on the display
Unload	To unload the compressor manually

### 1.2.3 Compressor control modes

Key switch (S5-Fig. 1.4) allows the operator to select four control modes:

Key position	Compressor control mode
10	Compressor off.
11	Local control mode (remote control mode is made inactive). The compressor can only be controlled by the buttons on the control panel. The compressor can be started and stopped via function <b>Timer</b> (see section 1.2.1), if programmed and activated.
12	Remote control mode 1 (local control is made inactive). The compressor can only be started and stopped by an ES100 sequence controller or by external switches. Compressor start/stop commands via function <b>Timer</b> (see section 1.2.1) are still possible, if programmed and activated. Emergency stop button (S2-Fig. 1.4) remains active.
13	Remote control mode 2. The compressor can be controlled by an ES-type controller or by computer. Consult Atlas Copco.

**Important**

- The control module will only react to a new control mode if the new position of the control mode switch is maintained for 3 seconds.
- To avoid unauthorised switching over to another control mode, take out the key after selecting the required mode.

**1.2.4 External compressor status indication**

Terminal strip (1X1-Fig. 1.10) is provided with auxiliary contacts for external indication of:

Indication	Relay	Terminals on strip 1X1	Max. load
Automatic operation	K06	11-12	10 A / 230 V AC
Warning	K07	13-14	10 A / 230 V AC
Shut-down	K08	15-16	10 A / 230 V AC
Compressor loaded	K11	17-18	2.5 A / 230 V AC
Compressor running	K21	19-20	5.6 A / 230 V AC
Control mode REMOTE 1	--	21-22	10 A / 230 V AC

Stop the compressor and switch off the voltage before connecting external equipment. Consult Atlas Copco.

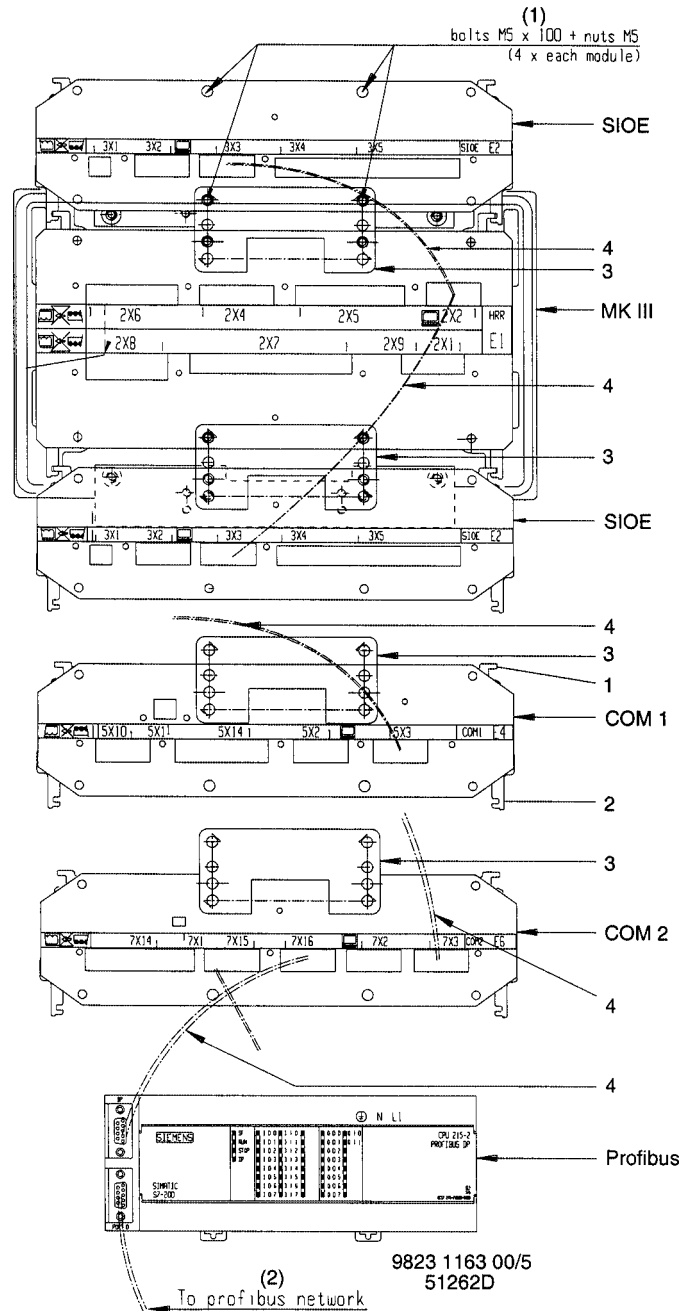
**1.2.5 External communication**

If it is desired to connect the compressor to an Atlas Copco ES system (e.g. to an ES100 sequence selector) an optional communication module (COM1 or COM2) needs to be installed. If it is desired to connect the compressor to a profibus network, a profibus module in combination with a COM2 module must be installed.

**Installation (Fig. 1.7)**

**Communication module**

1. Slide the communication module with its guides (1) into slots (2) of the module of the compressor regulator and fix it using plate (3).
2. Connect the 24V power supply from terminals (6 and 7) of terminal strip (1X1) to connector (..X1) of the communication module.
3. Connect an earth cable between the communication module and the module of the compressor regulator.
4. Connect the cable delivered with the communication module from connector (..X3) of the communication module to a free ..X2 connector on a module of the compressor regulator.
5. Consult Atlas Copco to check the installation and to have the communication software loaded.



- COM1/2    Communication module
- MKIII    Elektronikon regulator
- SIOE    Expansion modules (upper module not installed)
- PROFIBUS    Profibus module
- 1    Guide
- 2    Slot
- 3    Plate
- 4    Cable

Fig. 1.7 Installation of communication module for ZT with Elektronikon regulator (example)



**Profibus module**

1. Install the COM2 module as described above.
2. Connect the cable (delivered with the profibus module) from connector (DP) of the profibus module to connector (7X16) of the (COM2) module.
3. Connect the profibus network to connector (PORT0) of the profibus module.
4. Connect the 24V power supply from terminals (6 and 7) of terminal strip (1X1) to terminals (N and L1) on the profibus module.
5. Connect an earth cable between the profibus module and the module of the compressor regulator.
6. Consult Atlas Copco to check the installation and to have the communication software loaded.

**1.3 Electropneumatic control system**

**1.3.1 Electropneumatic regulator**

**Automatic control of compressor operation**

The regulator maintains the net pressure between pre-set limits by automatically loading and unloading the compressor.

The regulator has circuits:

- to delay loading for 20 seconds after starting
- to stop the motor after 20 minutes of uninterrupted unloaded operation
- to prevent a restart for 5 seconds after stopping

**Protecting the compressor**

The compressor will be shut down if:

- the motor current exceeds the permissible maximum
- the air outlet temperature of the low- or high-pressure compressor element exceeds the pre-set value
- the air inlet temperature of the high-pressure compressor element exceeds the pre-set value
- the oil temperature exceeds the pre-set value
- the oil pressure drops below the pre-set value
- the fan motor current exceeds the permissible maximum

**1.3.2 Control panel (Fig. 1.8)**

- 1 Voltage on LED  
Lights up after switching on the voltage.
- 2 Low oil pressure LED  
Lights up if the compressor is stopped because of too low an oil pressure.
- 3 High air temperature LED  
Lights up if the compressor is stopped because of too high a temperature at the outlet of the low-pressure compressor element.
- 4 Automatic operation LED  
Indicates that the regulator is automatically controlling the compressor: the compressor is loaded, unloaded, stopped and restarted depending on the air consumption.

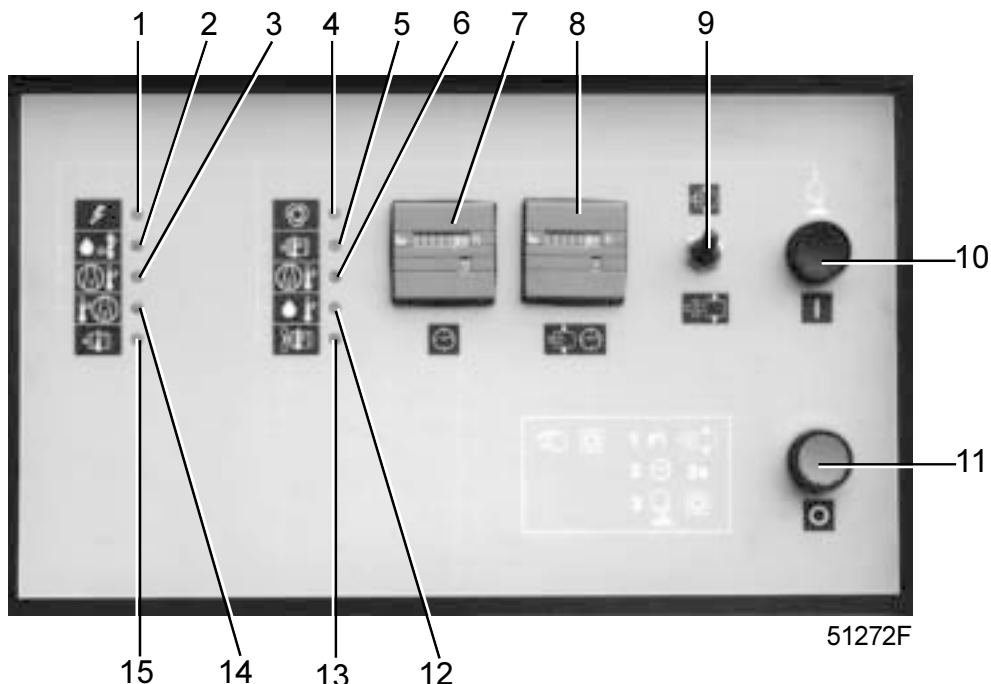


Fig. 1.8 Control panel for ZT with electropneumatic regulator

- |   |   |
|---|---|
| <p>5 Motor overload LED<br/>Lights up if the compressor is stopped because of motor overload.</p> <p>6 High air temperature LED<br/>Lights up if the compressor is stopped because of too high a temperature at the outlet of the high-pressure compressor element.</p> <p>7 Hourmeter<br/>Indicates the total motor running time in hours.</p> <p>8 Hourmeter<br/>Indicates the total compressor loading time in hours.</p> <p>9 Load/unload toggle switch<br/>Switch to manually unload and load the compressor.</p> <p>10 Reset/start button<br/>Push button to reset the blocking circuit (in case the compressor was shut down) and to start the compressor.</p> <p>11 Stop button<br/>Push button to stop the compressor.</p> <p>12 High oil temperature LED<br/>Lights up if the compressor is stopped because of too high an oil temperature.</p> | <p>13 Fan motor overload<br/>Lights up if the compressor is stopped because of fan motor overload.</p> <p>14 High air temperature LED<br/>Lights up if the compressor is stopped because of too high a temperature at the inlet of the high-pressure compressor element.</p> <p>15 Motor high temperature LED<br/>Lights up if the motor winding temperature becomes too high (if the motor is equipped with the optional thermistor protection).</p> |
|---|---|

### 1.3.3 Instrument panel (Fig. 1.9)

- 1 Temperature indicator/switch  
The white pointer indicates the temperature at the outlet of the low-pressure compressor element, the red pointer indicates the set shut-down temperature.
- 2 Temperature indicator/switch  
The white pointer indicates the temperature at the inlet of the high-pressure compressor element, the red pointer indicates the set shut-down temperature.

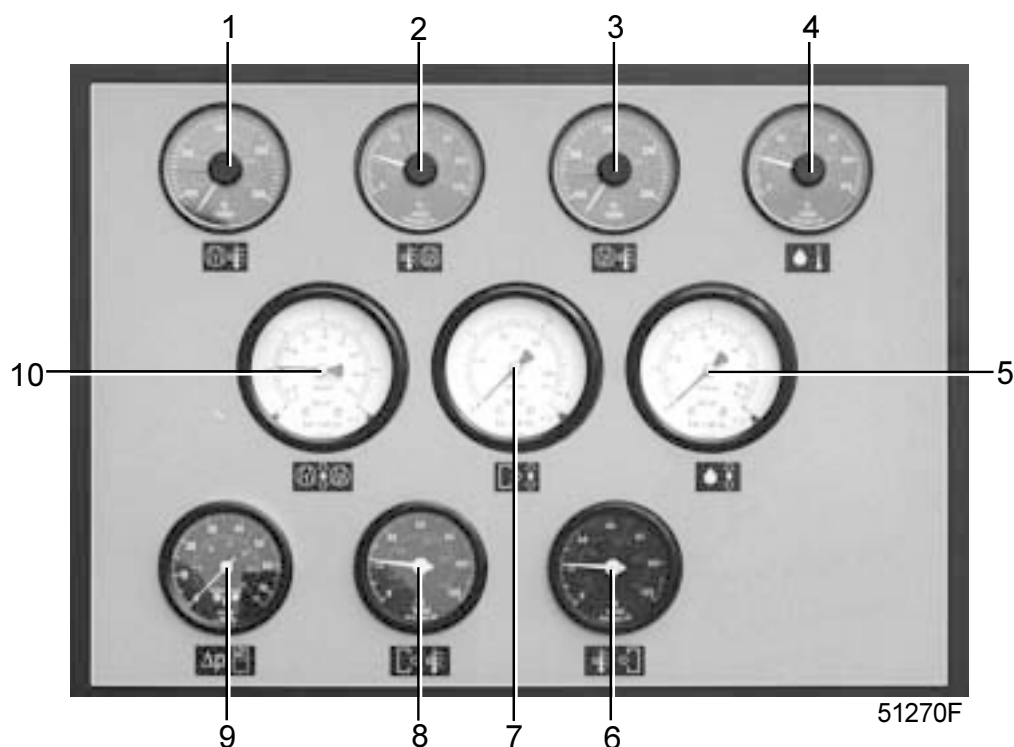


Fig. 1.9 Instrument panel for ZT with electropneumatic regulator

- 3 Temperature indicator/switch  
The white pointer indicates the temperature at the outlet of the high-pressure compressor element, the red pointer indicates the set shut-down temperature.
- 4 Temperature indicator/switch  
The white pointer indicates the oil temperature, the red pointer indicates the set shut-down temperature.
- 5 Pressure gauge  
Indicates the oil pressure.
- 6 Temperature indicator  
Indicates the temperature of the discharge air.
- 7 Pressure gauge  
Indicates the air discharge pressure.
- 8 Temperature gauge  
Indicates the temperature of the cooling air.
- 9 Pressure gauge  
Indicates the pressure drop over the air filter.
- 10 Pressure gauge  
Indicates the intercooler pressure.

## 1.4 Regulating system (Figs. 1.11 and 1.12)

### 1.4.1 Air flow

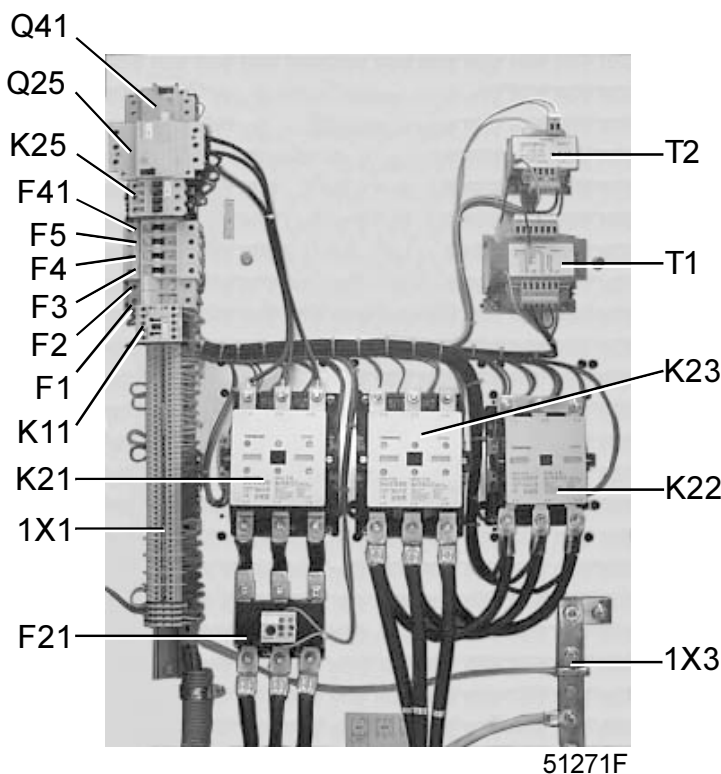
Air drawn through filter (1) is compressed in low-pressure compressor element (12) and discharged to pre-intercooler (13) and intercooler (21). The cooled air is further compressed in high-pressure compressor element (15) and discharged through silencer (16), check valve (18), pre-aftercooler (17) and aftercooler (23) towards the air net.

### 1.4.2 Condensate drain system

Two moisture traps are installed: one downstream of the intercooler (21) to prevent condensate from entering compressor element (15) and one downstream of the aftercooler (23) to prevent condensate from entering the air outlet pipe. The condensate is collected in drain receivers (28 and 19 respectively). Each drain receiver is provided with a float valve to automatically drain condensate and a manual drain valve.

### 1.4.3 Oil system

Oil is circulated by pump (24) from the sump of the gear casing through cooler (25) and the cooling jackets of compressor elements (12 and 15), as well as through filter (26) towards the bearings and timing gears.



- F1/F5 Circuit breakers
- F21 Overload relay, compressor motor
- F41 Circuit breaker, gear motor of dryer
- K11 Auxiliary relay, loading
- K21 Line contactor
- K22 Star contactor
- K23 Delta contactor
- K25 DOL contactor, fan motor
- Q25 Circuit breaker, fan motor
- Q41 Circuit breaker, fan motor of dryer
- T1 Main transformer
- T2 Transformer, module supply
- 1X1 Terminal strip
- 1X3 Earthing strip

Fig. 1.10 Electric cabinet of ZT with Elektronikon regulator (example)

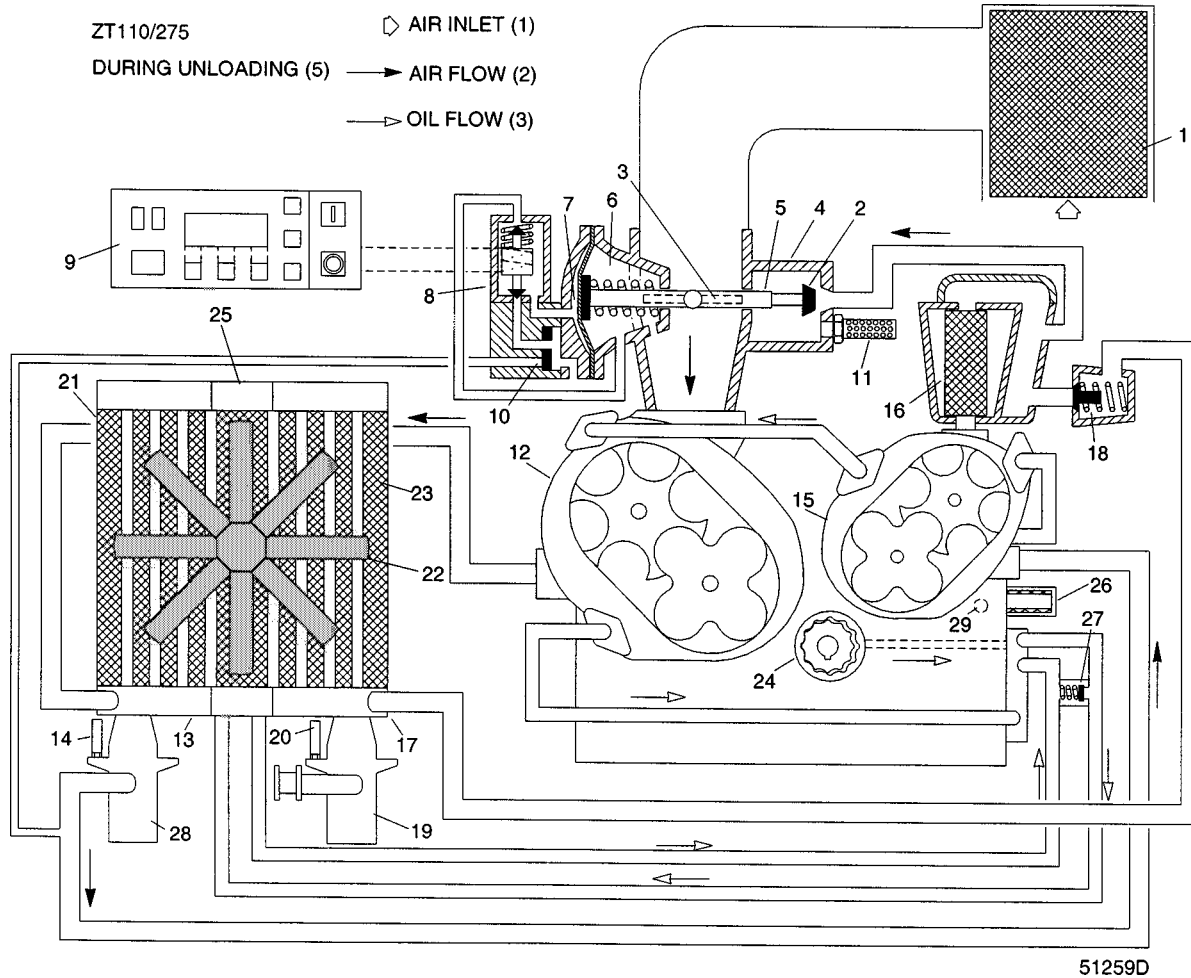


Fig. 1.11 Flow diagram during unloading

- |    |                         |    |                                  |    |                            |
|----|-------------------------|----|----------------------------------|----|----------------------------|
| 1  | Air filter(s)           | 11 | Silencer                         | 20 | High-pressure safety valve |
| 2  | Unloading valve         | 12 | Low-pressure compressor element  | 21 | Intercooler                |
| 3  | Full-load/no-load valve | 13 | Pre-intercooler                  | 22 | Fan                        |
| 4  | Unloader                | 14 | Low-pressure safety valve(s)     | 23 | Aftercooler                |
| 5  | Plunger                 | 15 | High-pressure compressor element | 24 | Oil pump                   |
| 6  | Chamber                 | 16 | Silencer                         | 25 | Oil cooler                 |
| 7  | Chamber                 | 17 | Pre-aftercooler                  | 26 | Oil filter                 |
| 8  | Loading solenoid valve  | 18 | Check valve                      | 27 | By-pass valve              |
| 9  | Elektronikon® regulator | 19 | Moisture trap, aftercooler       | 28 | Moisture trap, intercooler |
| 10 | Diaphragm               |    |                                  | 29 | Oil circuit by-pass valve  |

Figs. 1.11 and 1.12 Flow diagrams

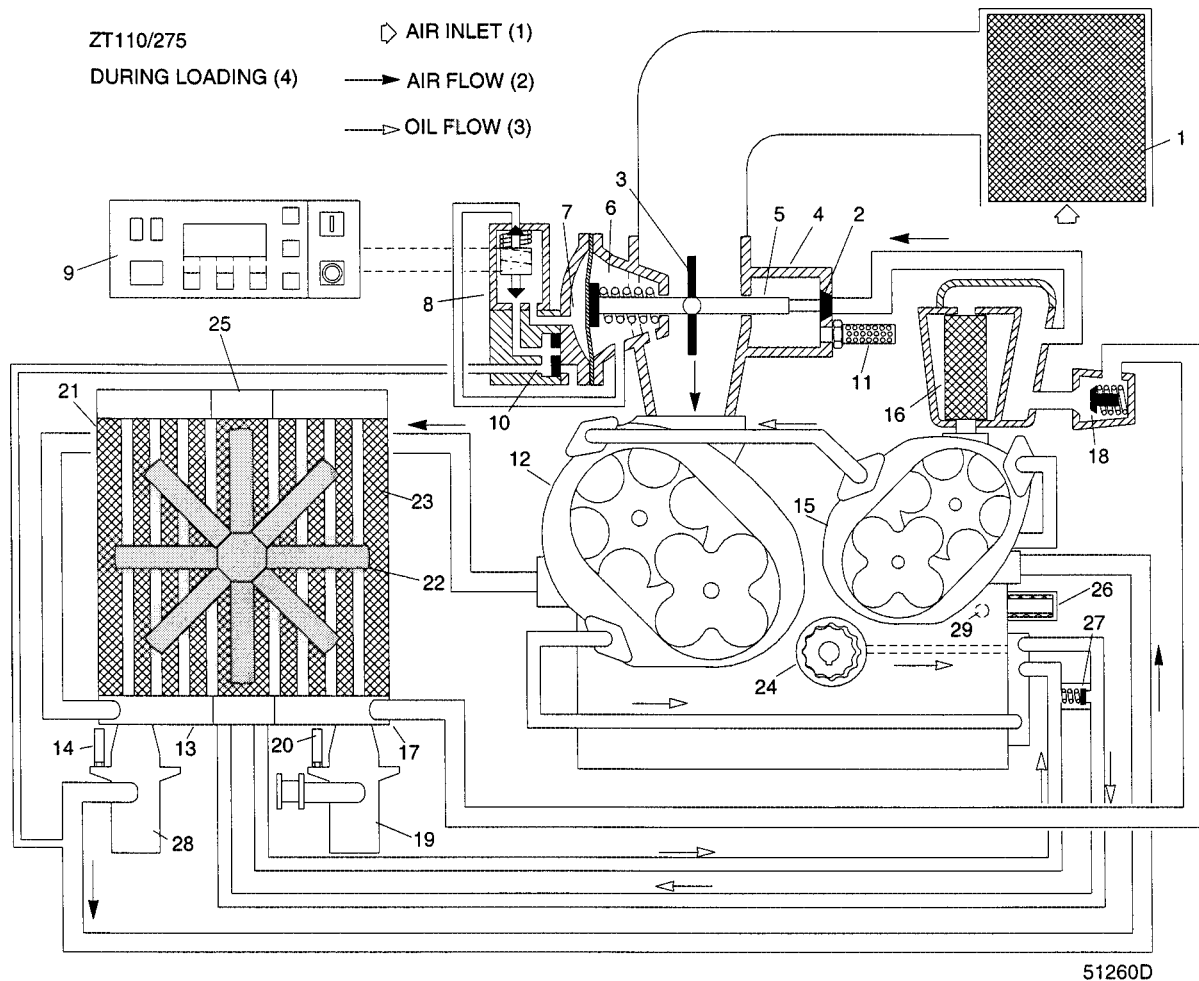


Fig. 1.12 Flow diagram during loading

Valve (29) by-passes oil cooler (25) when starting the compressor from cold condition to ensure rapid warming of the oil to normal working temperature. Valve (27) opens if the oil pressure should rise above a given value.

#### 1.4.4 Cooling system

The compressors are provided with oil cooler (25), intercoolers (13/21) and aftercoolers (17/23). The coolers are cooled by fan (22) which is driven by an electric motor.

#### 1.4.5 Regulating system

The system is controlled by Elektronikon® regulator (see section 1.2) or electropneumatic regulator (see section 1.3), which keep the net pressure within programmable pressure limits by automatically loading and unloading the compressor depending on the air consumption.

#### During unloading (Fig. 1.11)

If the air consumption is less than the air delivery of the compressor, the net pressure increases. When the net pressure reaches the upper limit of the working pressure (unloading pressure), solenoid valve (8) is de-energised. The plunger of solenoid valve (8) moves by spring force shutting off the supply of control air to unloader (4):

1. Control pressure is vented from chamber (7) of unloader (4) through solenoid valve (8) and chamber (6) towards the inlet of compressor element (12).
2. As there is no longer any pressure difference between chambers (6 and 7), plunger (5) returns by spring force keeping full-load/no-load valve (3) closed and unloading valve (2) open.
3. Compressed air between check valve (18) and valve (2) is blown off through silencer (11). Check valve (18) closes.
4. As vacuum prevails in intercoolers (13/21), diaphragm (10) switches to the left.

Air delivery is stopped (0%), the compressor runs unloaded.

### During loading (Fig. 1.12)

When the net pressure decreases to the lower limit of the working pressure (loading pressure), solenoid valve (8) is energised. The plunger of solenoid valve (8) moves against spring force opening the supply port of control air to unloader (4):

1. Atmospheric pressure is allowed through solenoid valve (8) to chamber (7) of unloader (4). As this pressure is higher than the pressure in chamber (6), full-load/no-load valve (3) starts opening.
2. Intercooler pressure is building up causing diaphragm (10) to switch to the right. As the pressure difference between chambers (6 and 7) increases, plunger (5) moves further against spring force until full-load/no-load valve (3) is fully open and unloading valve (2) closed.

Air delivery is resumed (100%), the compressor runs loaded.

## 2 INSTALLATION

### 2.1 Dimension drawings (Figs. 2.1 and 2.2)

See next page.

### 2.2 Installation proposal (Fig. 2.3)

Ref.	Description
------	-------------

- |    |   |
|----|---|
| 1. | Install the compressor on a level floor suitable for taking the weight of the compressor. Recommended minimum distance between the top of the bodywork and the ceiling: 1200 mm.                    |
| 2. | Remove the plastic plug (if provided) from the compressor air outlet pipe and install an air outlet valve. See Figs. 2.1 and 2.2 for the dimensions. Close the valve and connect it to the air net. |
| 3. | The pressure drop over the delivery pipe can be calculated as follows:  |

$$dP = \frac{L \times 450 \times Qc^{1.85}}{d^5 \times P}$$

dP = pressure drop (recommended maximum = 0.1 bar)

L = length of delivery pipe in m

d = inner diameter of the delivery pipe in mm

P = absolute pressure at the compressor outlet in bar(a)

Qc = free air delivery of the compressor in l/s

It is recommended that the connection of the compressor air delivery pipe is made on top of the main air net pipe to minimise carry-over of possible remainder of condensate.

As a rule of thumb, following formula can be used to calculate the recommended volume of the air net:

$$V = \frac{30 \times C \times p \times Q}{dP}$$

#### Footnotes chapter 1

- 1) This function is called the **Timer** function. See "User manual for Elektronikon® regulator", section "Timer submenu".

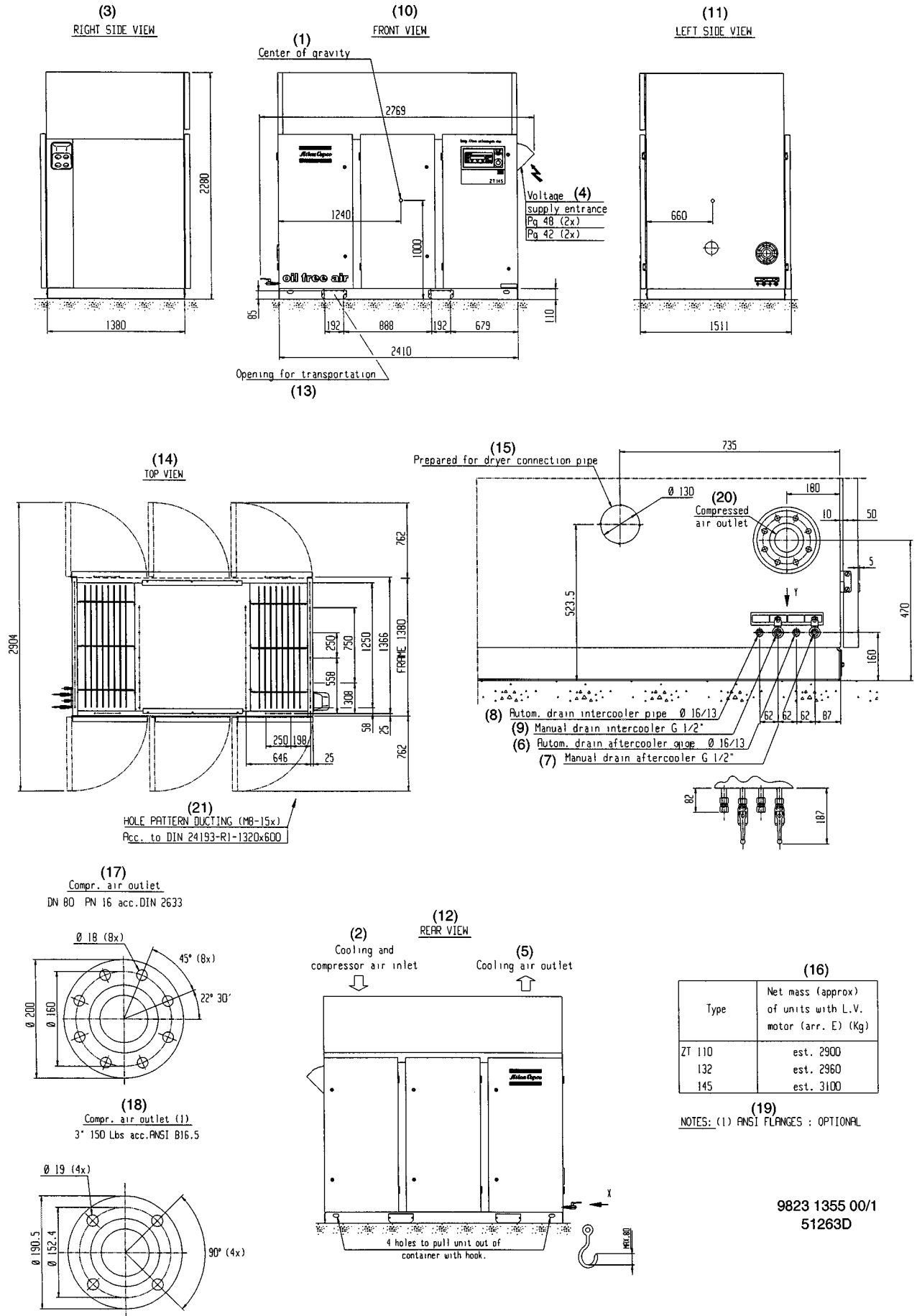


Fig. 2.1 Dimension drawing, ZT110-145

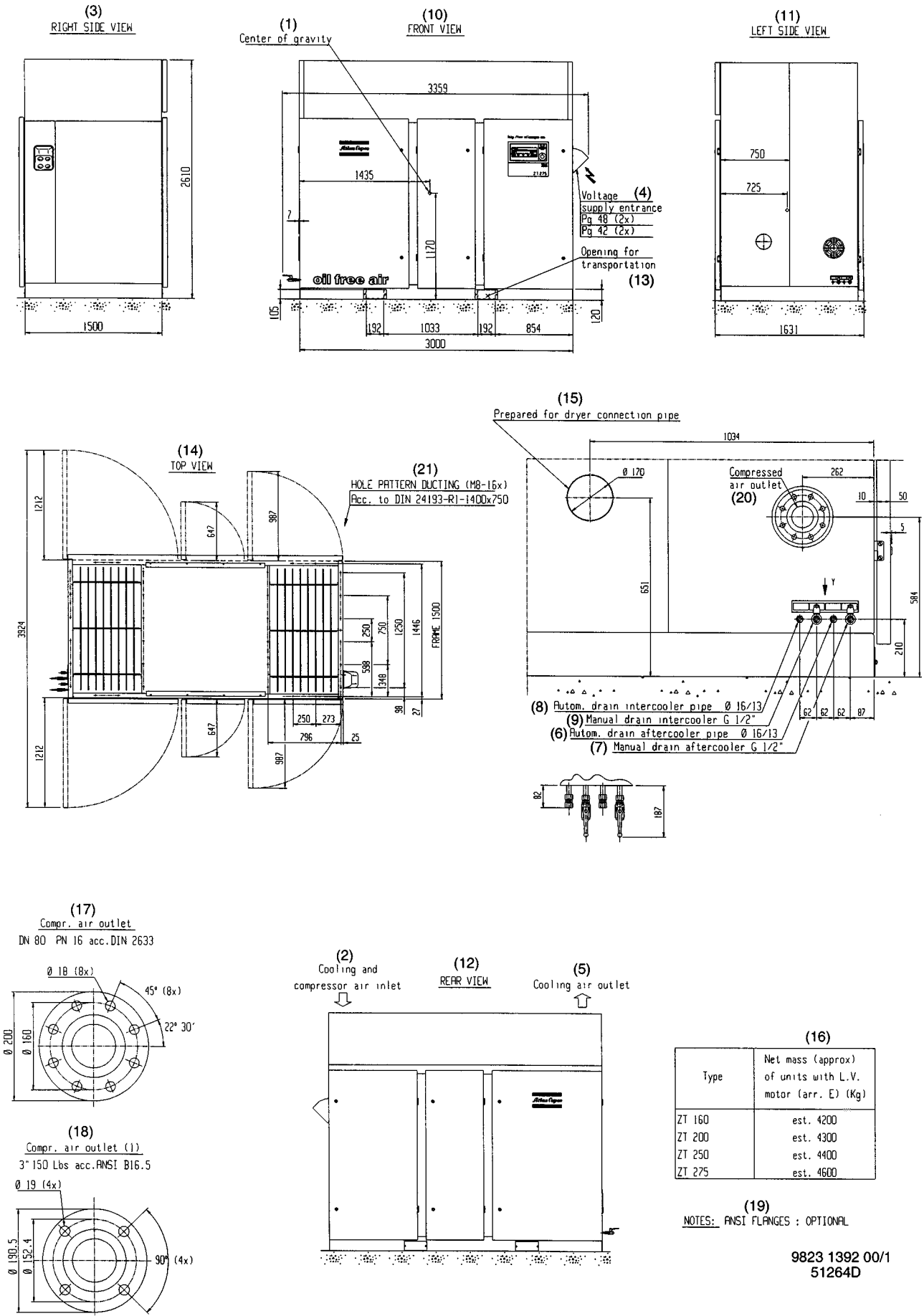
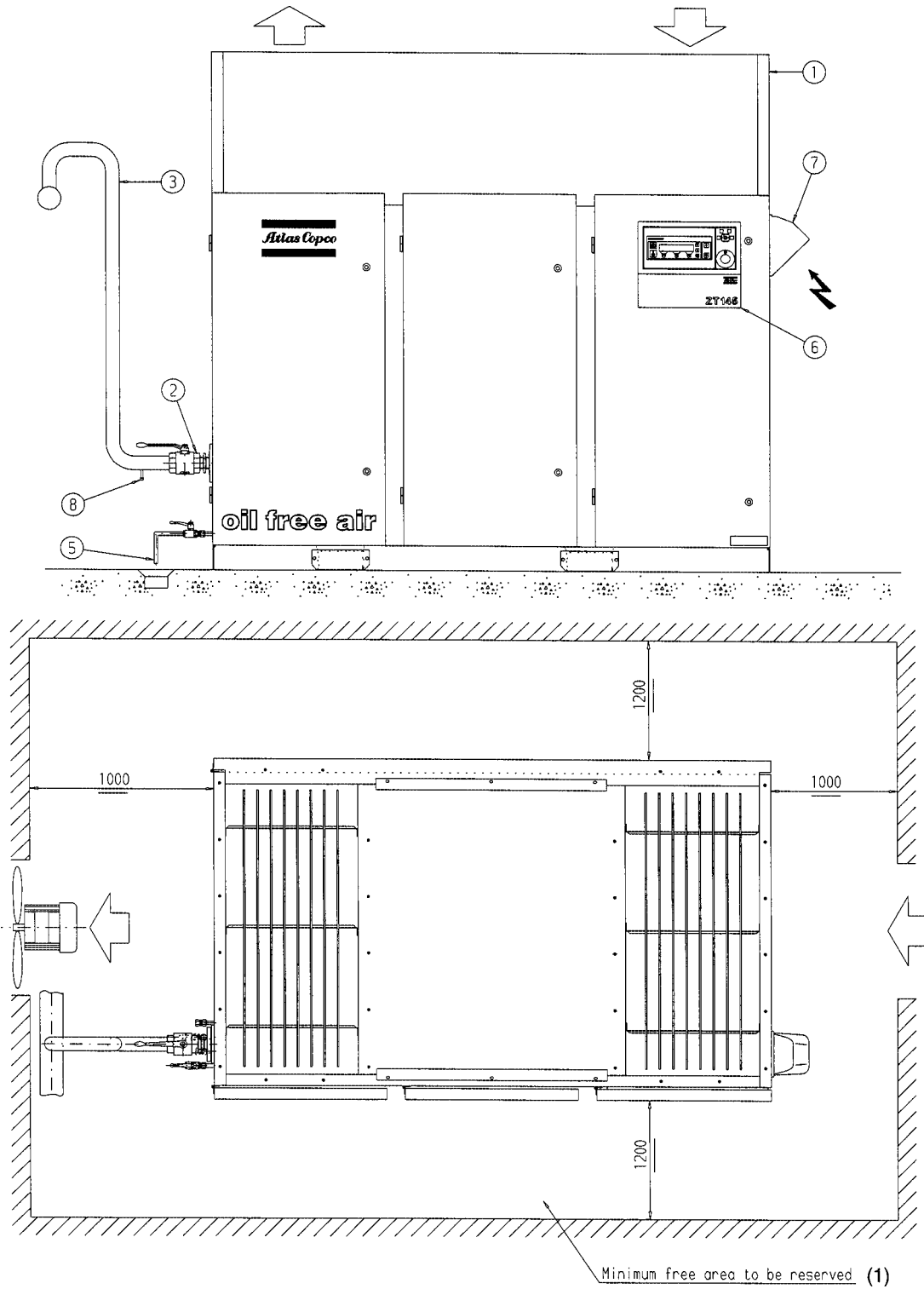
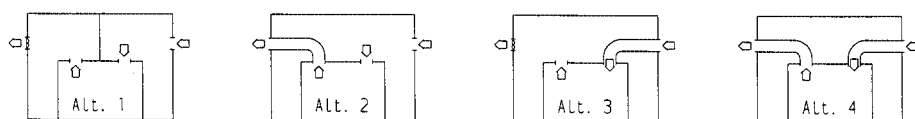


Fig. 2.2 Dimension drawing, ZT160-275





④ Ventilation proposals (2)



9823 1441 00  
50482E

Fig. 2.3 Installation proposal

- V = recommended air net volume in l  
 dP = pressure difference between unloading and loading pressures in bar (recommended minimum = 0.6)  
 p = compressor inlet pressure in bar absolute  
 Q = free air delivery of compressor in l/s  
 C = correction factor, see below

**Air consumption divided  
 by compressor air delivery**      **C**

0.9	0.10
0.8	0.15
0.7	0.20
0.5	0.25
0.3	0.20
0.2	0.15
0.1	0.10

4. The inlet grids and ventilation fan should be installed in such a way that any recirculation of cooling air to the compressor is avoided. The air velocity to the grids should be limited to 5 m/s.

For ventilation proposals 1 and 3, the required ventilation capacity (per compressor installed) to limit the compressor room temperature can be calculated as follows:

$$Q_v = 0.9 N / dT$$

- Q<sub>v</sub> = required ventilation capacity in m<sup>3</sup>/s  
 N = shaft input of the compressor in kW  
 dT = temperature rise over ambient in °C

If cooling air ducts are installed, the maximum allowable pressure drop over the ducts is 30 Pa. Common ducting for several compressors is not allowed.

5. Fit the manual condensate drain valves (2/4-Fig. 1.3). Lay out the drain piping from valves (2/4) and automatic condensate outlets (3/5) towards the condensate collector. The drain pipes must not dip into the water of the collector. It is recommended to provide a funnel to allow visual inspection of the condensate flow.
6. Elektronikon control system with control panel.
7. See section 2.3 for the recommended cable size of the supply cables. Check that the electrical connections correspond to the local codes. The installation must be earthed and protected against short circuits by fuses in all phases. See section 7.4. An isolating switch must be installed near the compressor.
8. Condensate drain valve.

**Warning** *In case the compressor is ordered as "Hot air version" (see section 8.3), thermal insulation should be provided to protect against the high temperature of the air outlet valve and air delivery pipe.*

## 2.3 Electric cables

### 2.3.1 Size

#### Remarks

- Local regulations remain applicable if they are stricter than the values proposed below.
- The voltage drop must not exceed 5 % of the nominal voltage. It may be necessary to use cables with a larger size than those stated to comply with this requirement.

## 50 Hz compressors

Compressor	Supply voltage (V)	Up to 40 degrees Celsius ambient (mm <sup>2</sup> )	Up to 45 degrees Celsius ambient (mm <sup>2</sup> )
ZT110	230	2x (3x150 + 95)	2x (3x150 + 95)
ZT110	400	3x120 + 70	3x150 + 95
ZT110	500	3x95 + 50	3x95 + 50
ZT132	230	2x (3x185 + 95)	2x (3x185 + 95)
ZT132	400	3x185 + 95	3x185 + 95
ZT132	500	3x120 + 70	3x120 + 70
ZT145	230	2x (3x185 + 95)	2x (3x240 + 120)
ZT145	400	2x (3x95 + 50)	2x (3x95 + 50)
ZT145	500	2x (3x70 + 35)	2x (3x70 + 35)
ZT160	230	4x (3x95 + 50)	4x (3x120 + 70)
ZT160	400	2x (3x120 + 70)	2x (3x120 + 70)
ZT160	500	3x185 + 95	3x185 + 95
ZT200	230	4x (3x150 + 95)	4x (3x185 + 95)
ZT200	400	2x (3x150 + 95)	2x (3x185 + 95)
ZT200	500	2x (3x95 + 50)	2x (3x120 + 70)
ZT250	230	4x (3x185 + 95)	4x (3x185 + 95)
ZT250	400	4x (3x70 + 35)	4x (3x95 + 50)
ZT250	500	2x (3x150 + 95)	2x (3x150 + 95)

**Note:** The size is valid for cable PVC 70 degrees Celsius according to EN60204.

## 60 Hz compressors

Compressor	Supply voltage (V)	Up to 40 degrees Celsius ambient (mm <sup>2</sup> )	Up to 45 degrees Celsius ambient (mm <sup>2</sup> )
ZT110	220-230	2x (3xMCM350 + AWG0)	2x (3xMCM350 + AWG0)
ZT110	380	2x (3xAWG2/0 + AWG2)	2x (3xAWG3/0 + AWG2)
ZT110	440-460	2x (3xAWG2/0 + AWG2)	2x (3xAWG2/0 + AWG2)
ZT110	575	3xAWG3/0 + AWG2	3xAWG3/0 + AWG2
ZT145	220-230	4x (3xAWG3/0 + AWG2)	4x (3xAWG4/0 + AWG2)
ZT145	380	2x (3xAWG4/0 + AWG2)	2x (3xAWG4/0 + AWG2)
ZT145	440-460	2x (3xAWG3/0 + AWG2)	2x (3xAWG4/0 + AWG2)
ZT145	575	3xMCM250 + AWG0	3xMCM300 + AWG0
ZT160	220-230	4x (3xAWG4/0 + AWG2)	4x (3xAWG4/0 + AWG2)
ZT160	380	2x (3xMCM250 + AWG0)	2x (3xMCM300 + AWG0)
ZT160	440-460	2x (3xAWG4/0 + AWG2)	2x (3xMCM250 + AWG0)
ZT160	575	3xMCM300 + AWG0	3xMCM350 + AWG0
ZT200	220-230	4x (3xMCM300 + AWG0)	4x (3xMCM300 + AWG0)
ZT200	380	2x (3xMCM350 + AWG0)	2x (3xMCM350 + AWG0)
ZT200	440-460	2x (3xMCM300 + AWG0)	2x (3xMCM300 + AWG0)
ZT200	575	2x (3xAWG3/0 + AWG2)	2x (3xAWG4/0 + AWG2)
ZT250	380	4x (3xAWG2/0 + AWG2)	4x (3xAWG3/0 + AWG2)
ZT250	440-460	2x (3xMCM350 + AWG0)	4x (3xAWG2/0 + AWG2)
ZT250	575	2x (3xMCM250 + AWG0)	2x (3xMCM250 + AWG0)
ZT275	380	4x (3xAWG3/0 + AWG2)	4x (3xAWG4/0 + AWG2)
ZT275	440-460	4x (3xAWG2/0 + AWG2)	4x (3xAWG3/0 + AWG2)
ZT275	575	2x (3xMCM300 + AWG0)	2x (3xMCM300 + AWG0)

**Note:** The size is valid for cable 90°C.



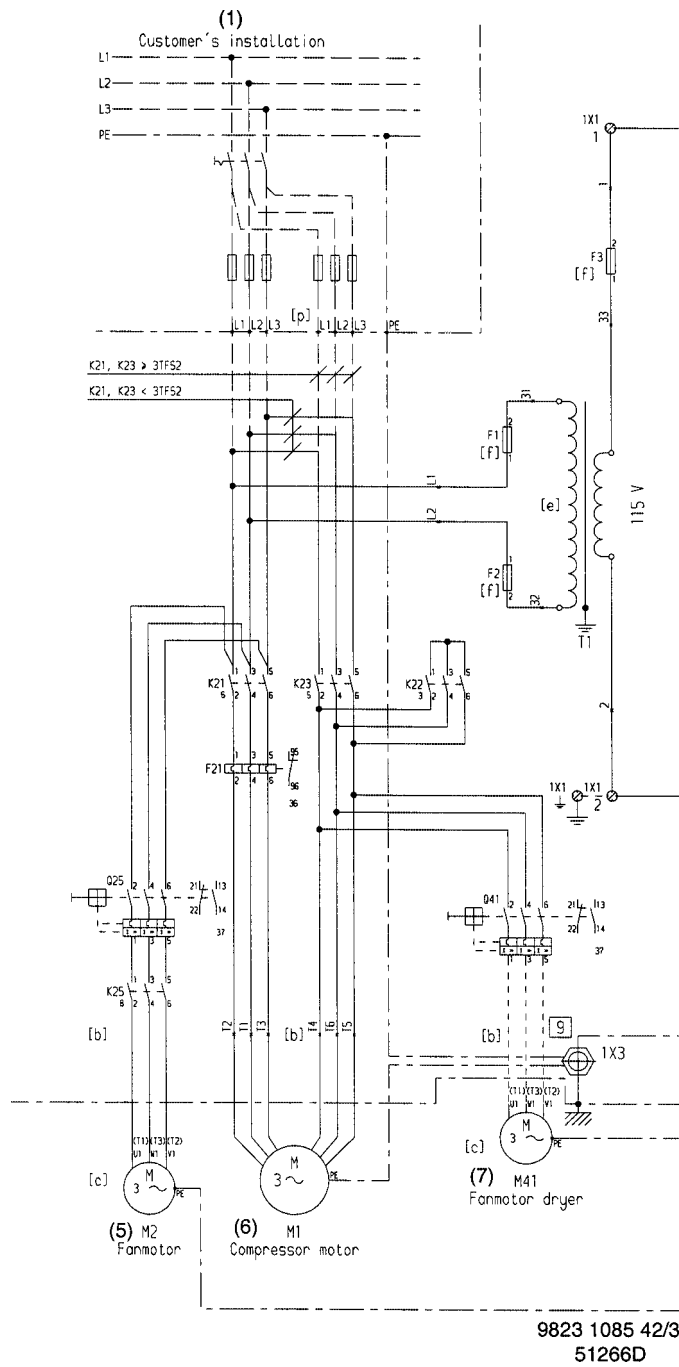
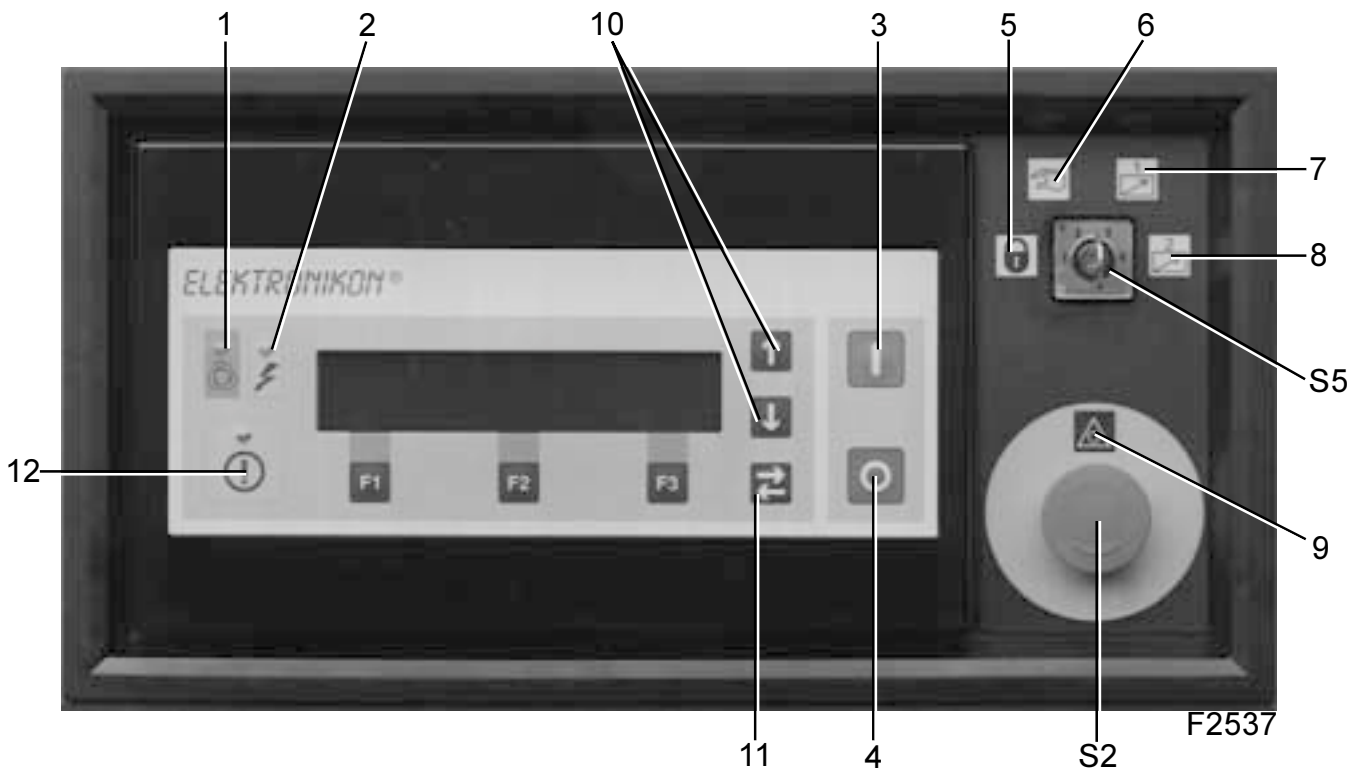


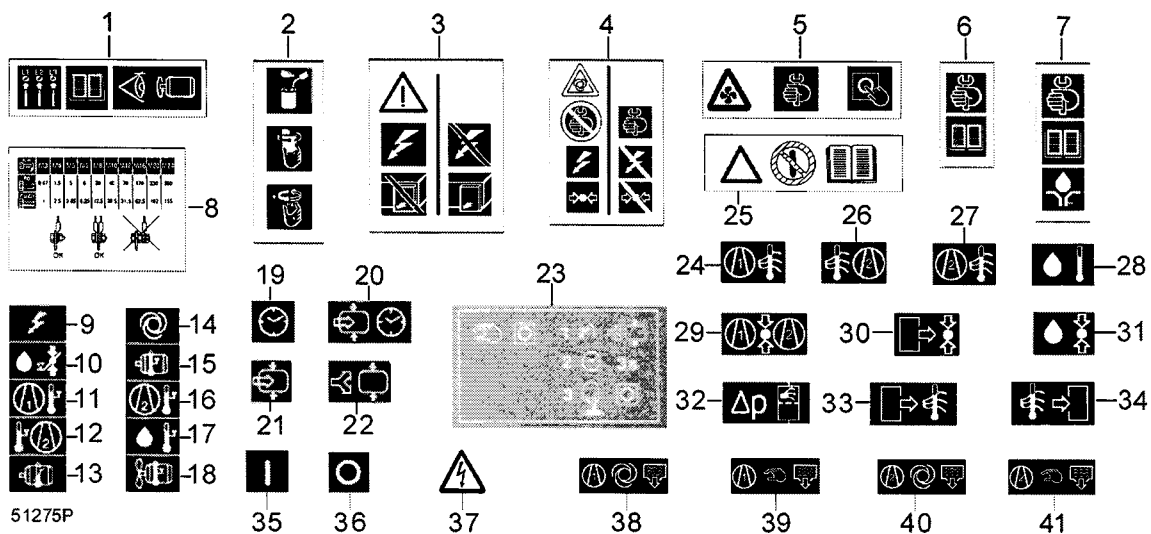
Fig. 2.5 Electrical connections, 60 Hz CSA/UL

## 2.4 Pictographs



- |   |                     |    |                                       |    |                                |
|---|---------------------|----|---------------------------------------|----|--------------------------------|
| 1 | Automatic operation | 5  | Compressor locked (in off position)   | 8  | Remote control (by computer)   |
| 2 | Voltage on          | 6  | Local control                         | 9  | Emergency stop                 |
| 3 | Start               | 7  | Remote control (by external switches) | 10 | Keys to scroll through display |
| 4 | Stop                | 11 | Key to go to next field on display    | 12 | Alarm                          |

Fig. 2.6 Pictographs on Elektronikon regulator



- 1 Before connecting the compressor electrically, consult the Instruction book for the motor rotation direction
- 2 Oil the gaskets, screw on the filters and tighten by hand (approx. one half turn)
- 3 Switch off the voltage before removing the protecting cover inside the electric cabinet
- 4 Switch off the voltage and depressurise the compressor before maintenance or repair
- 5 Stop compressor before servicing fans
- 6 Consult the Instruction book before maintenance or repair
- 7 Consult the Instruction book before greasing
- 8 Torques for steel (Fe) or brass (CuZn) bolts
- 9 Voltage on
- 10 Oil pressure too low
- 11 Outlet temperature low-pressure compressor element too high
- 12 Inlet temperature high-pressure compressor element too high
- 13 Motor temperature too high
- 14 Automatic operation
- 15 Motor overload
- 16 Outlet temperature high-pressure compressor element too high
- 17 Oil temperature too high
- 18 Fan motor overload
- 19 Timer, running hours
- 20 Timer, compressor loaded hours
- 21 Loaded operation
- 22 Unloaded operation
- 23 Unload compressor, wait a few seconds, then stop compressor
- 24 Air temperature, low-pressure compressor element outlet
- 25 Read Instruction book before starting the compressor
- 26 Air temperature, high-pressure compressor element inlet
- 27 Air temperature, high-pressure compressor element outlet
- 28 Oil temperature
- 29 Intercooler pressure
- 30 Discharge pressure
- 31 Oil pressure
- 32 Pressure drop, air filter
- 33 Discharge temperature
- 34 Cooling air temperature
- 35 Start
- 36 Stop
- 37 Warning: under tension
- 38 Automatic condensate outlet, intercooler
- 39 Condensate valve, intercooler
- 40 Automatic condensate outlet, aftercooler
- 41 Condensate valve, aftercooler

Fig. 2.7 Pictographs

### 3 OPERATING INSTRUCTIONS

#### Safety precautions

The operator must apply all related safety precautions including those mentioned in this book.

#### Outdoor/altitude operation

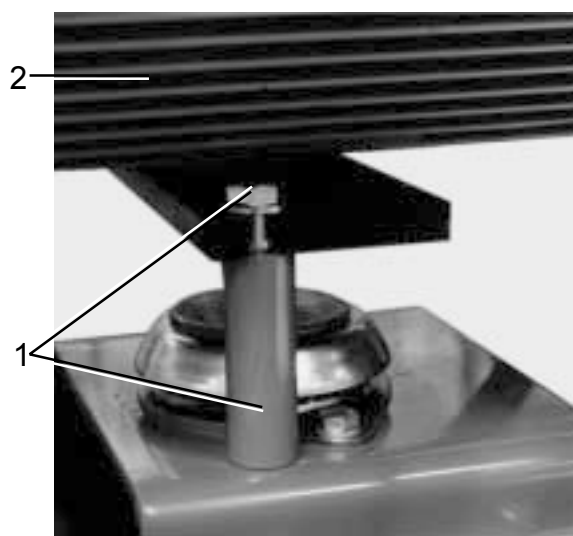
If the compressor is installed outdoors or if the air inlet temperature can be below 0 degrees Celsius, precautions must be taken. In this case, and also for altitude operation, consult Atlas Copco.

#### Moving/lifting

The compressor can be moved by a lift truck using the slots in the frame. Make sure that the forks protrude from the other side of the frame. The compressor can also be lifted after inserting beams in the slots. Make sure that the beams cannot slide and that they protrude from the frame equally. The chains must be held parallel to the bodywork by chain spreaders in order not to damage the compressor. The lifting equipment must be placed in such a way that the compressor will be lifted perpendicularly. Lift smoothly and avoid twisting.

#### 3.1 Preparation for initial start-up

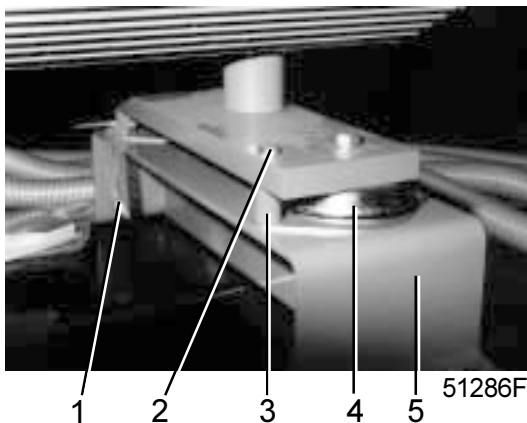
1. Consult section 2 for the electric cable size, installation proposal and dimension drawings.
2. **For ZT with an Elektronikon regulator** (Fig. 1.4), read the "User manual for Elektronikon® regulator" to familiarise yourself with all regulator functions.



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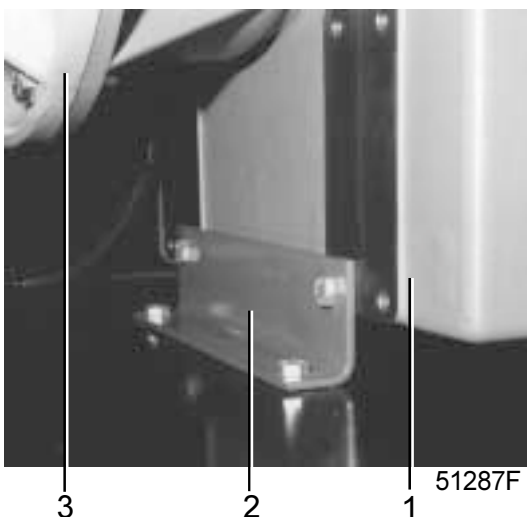
- 1 Transport bolt and spacer (painted red), to be removed
- 2 Drive motor

Fig. 3.1 Transport fixations at motor side (typical example)



- 1 Bolts delivered loose to tighten the vibration dampers to the motor support
- 2 Transport bolt (painted red), to be removed and replaced by shorter one
- 3 Spacer (painted red), to be removed
- 4 Vibration damper
- 5 Motor support

Fig. 3.2 Transport fixations at motor side (typical example)

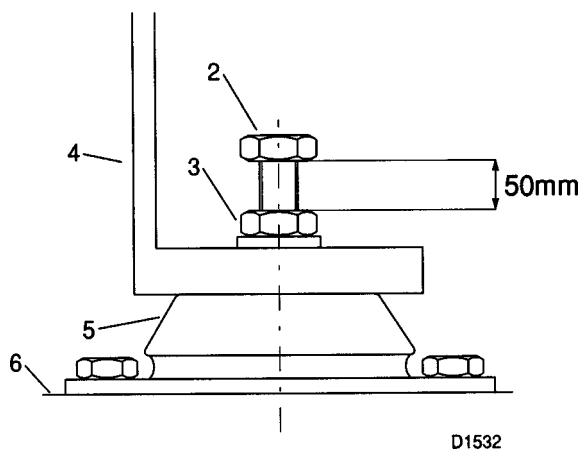
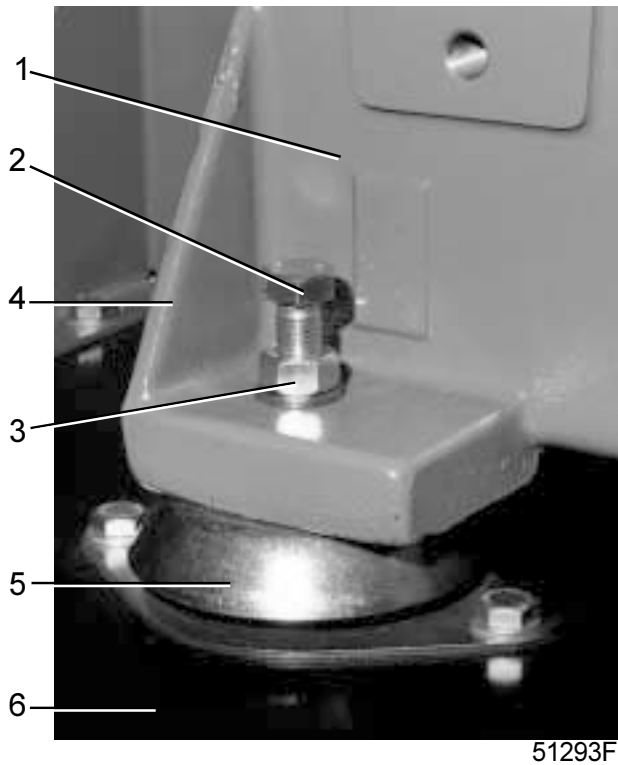


- 1 Gear casing
- 2 Transport support (painted red), to be removed
- 3 Drive motor

Fig. 3.3 Transport fixations at gear casing (typical example)

3. A sticker dealing in short with the operation instructions is delivered with the literature set. Affix the sticker next to the control panel.
4. The compressor and motor are secured to the frame, immobilising the vibration dampers during transport. All transport devices are painted red and must be removed:
  - At the motor side, the dampers may be secured by means of:
    - bolts/spacers fitted next to the dampers: remove the bolts and spacers (1-Fig. 3.1).
    - bolts/spacers fitted through one of the fixation holes of the dampers: remove bolts and spacers (2 and 3-Fig. 3.2) and fit shorter bolts (delivered with the compressor in a plastic bag (1-Fig. 3.2)) to tighten the vibration dampers securely to motor support (5-Fig. 3.2).
  - A transport support (2-Fig. 3.3) may be fitted to the gear casing, remove the support.
  - At the compressor side (Figs. 3.4 and 3.5), loosen nut (3) and unscrew bolt (2) until the distance between bolt and nut is as shown on Fig. 3.5. Tighten nut (3) to fix the support securely to the vibration damper. Repeat for the other support.
5. Remove flange (7-Fig. 5.1) and take out the silicagel bags. Refit the flange.
6. On Arr. 1 compressors supplied ex-factory with a motor, check the motor alignment as it may have been disturbed during transport.
7. Check that the compressor is filled with oil: oil must be visible in sight-glass (4-Fig. 5.1).
8. Check the voltage selecting wires at transformer (T1-Fig. 1.10) for correct connection. An instruction label is provided. Check the setting of overload relay (F21) and that the relay is set for automatic resetting. See section 7.4.
9. Switch on the voltage. Start the motor and stop it immediately. **Check for correct direction of rotation** of both the drive motor and the fan motor. When facing the drive end of the motors, the correct direction of rotation is counter-clockwise.  
First check the compressor motor. If the rotation direction is wrong, switch off the voltage and reverse two incoming lines.  
Then check the fan motor. If the rotation direction is wrong, switch off the voltage and reverse two connections at the terminals of circuit breaker (Q25-Fig. 1.10).
10. Run the compressor for a few minutes. Stop the compressor and check the oil level, which should be in the middle of sight-glass (4-Fig. 5.1) or in the upper field of the green range.





- 1 Gear casing
- 2 Bolt
- 3 Nut
- 4 Support
- 5 Vibration damper
- 6 Frame

Figs.3.4 and 3.5 Transport fixation at compressor side

### 3.2 Before starting

#### Attention

- The operator must apply all relevant safety precautions, including those mentioned in this instruction book.
- For compressors with Elektronikon regulator (Fig. 1.4) delivered without motor, the number of motor starts is programmed at maximum 3 per day. If required, consult the "User manual for Elektronikon® regulator" section "Modify settings" to modify this setting.

1. Check the oil level, which must be in the middle of sight-glass (4-Fig. 5.1) or in the upper field of the green range. Top up, if necessary, with the correct type of oil.
2. Close condensate drain valves (2 and 4-Fig. 1.3).

### 3.3 For ZT with Elektronikon regulator

#### 3.3.1 Routine starting (Fig. 1.4)

1. Open the air outlet valve (customer's installation).
2. Switch on the voltage and check that voltage on LED (2) lights up.
3. Press start button (8). The compressor starts running in unloaded condition and automatic operation LED (1) lights up.
4. Approx. 25 seconds later (programmable), the compressor starts running loaded. The message on display (4) changes from <<Automatically unloaded>> to <<Automatically loaded>>.

#### Important

- If the motor is stopped and automatic operation LED (1) is alight, the motor may start automatically.
- If the start/stop timer is active (see section 1.2.1), the compressor can start automatically, even if it was stopped manually.

#### 3.3.2 Starting after emergency stopping or shutdown (Fig. 1.4)

Press the emergency stop button (S2) (if not yet done so), switch off the voltage and then depressurise the compressor. After remedying the fault, unlock the emergency stop button by pulling it out and restart the compressor as described above.

If the automatic restart function after voltage failure is activated (see section 1.2.1) and the duration of repair is shorter than the programmed power recovery time, reset the display after remedying the fault: press the key <<Reset>>, the message <<All protection functions are OK>> will appear, whereafter the compressor can be restarted. Press the keys <<Menu>> and <<Main Screen>> to return to the main display (Fig. 1.5).

#### Minimum stop time

The compressor will not be allowed to restart within a programmed time (20 s) after a stop for whatever reason. A

start command given during the minimum stop time will be memorised; automatic operation LED (1) lights up. The compressor will start when the minimum stop time has run out.

### Manual restarting

In automatic operation, the regulator limits the number of motor starts, observe an interval of minimum 20 minutes between each manual start.

### 3.3.3 During operation (Fig. 1.4)

1. When automatic operation LED (1) is alight, starting and stopping of the motor is automatically controlled: when the motor is stopped, it may restart automatically.
2. Check the readings on display (4). See below.
3. On reaching the pre-set unloading pressure, shown on display (4), the compressor will run unloaded. From now on, the electronic control module will calculate the optimum moment to stop and restart the compressor motor automatically, depending on the maximum permissible number of motor starts and on the air consumption.
4. To unload the compressor manually, press the key <<Unload>> (5) 1). To put the compressor back into automatic operation, press the key <<Load>> (5) 1).

### Important

- If the compressor is stopped, it may start automatically. See also section 1.2.1.
- The control module will only react to a new control mode if the new position of the control mode switch is maintained for 3 seconds.
- To avoid unauthorised switching over to another control mode, take out the key (S5) after selecting the required mode. See also section 1.2.3.

### 3.3.4 Checking the display (4-Fig. 1.4)

1. Regularly check the display for readings and messages. Normally, the main display (Fig. 1.5) is shown, indicating the compressor outlet pressure, the status of the compressor and the functions of the keys below the display.
2. Always check the display and remedy the trouble if alarm LED (3) is alight or blinks. Consult section 1.2 and the "User manual for Elektronikon® regulator", section "Status data submenu".
3. The display will show a service message if one of the monitored components is to be serviced; replace the component, change the oil or grease the drive motor as the case may be. Reset the relevant timer. Consult the "User manual for Elektronikon® regulator", section "Service submenu".

**Warning** Before carrying out any maintenance, repair or adjustment, stop the compressor, press emergency stop button (S2-Fig. 1.4), switch off the voltage and depressurise the compressor.

### Notes

- Whenever a warning, service request, sensor error or motor overload message is displayed, the free spaces on the display between the function keys (5) are filled with blinking indicators (\*\*).
  - When more than one message needs to be displayed (e.g. both warning and service), the messages are continuously displayed for 3 seconds each.
4. Regularly press the key <<Show more>> (5) 2) to call up the actual compressor condition:
    - the status of controlling the compressor (automatic or manual, local or remote)
    - the status of the compressor start/stop timer (active or not) 3)
    - the maximum working pressure
    - the outlet pressure
    - the pressure drop over the air filters
    - the oil pressure
    - the intercooler pressure
    - the outlet temperature
    - the temperatures of the compressor elements
    - the oil temperature
    - the status of the overload protection of the drive motor (normal or not)
    - the total running and loading hours

### 3.3.5 Manual unloading/loading (Fig. 1.4)

Normally, the compressor runs in automatic operation, i.e. the electronic regulator loads, unloads, stops and restarts the compressor automatically. LED (1) is then alight.

If required, the compressor can be unloaded manually. In this case, the compressor is switched out of automatic operation, i.e. the compressor remains running unloaded unless it is loaded again manually.

#### Manual unloading 1)

Press the key <<Unload>> (5). LED (1) goes out. The message <<Manually Unloaded>> appears on the display.

#### Manual loading 1)

Press the key <<Load>> (5). LED (1) lights up. The command <<Load>> does not force the compressor in loaded condition, but it will switch the compressor to automatic operation again, i.e. the compressor will be loaded if the air net pressure drops below the programmed level.

### 3.3.6 Stopping (Fig. 1.4)

1. Close the air outlet valve.
2. Press stop button (9). The compressor will run unloaded for 3 seconds, after which it will stop.
3. **To stop the compressor immediately**, press emergency stop button (S2). Alarm LED (3) starts blinking. After remedying the trouble, unlock the emergency stop button by pulling it out.
4. Open the drain valves (2 and 4-Fig. 1.3).

### 3.4 For ZT with electropneumatic regulator

#### 3.4.1 Starting (Fig. 1.8)

1. Switch on the voltage and check that voltage on LED (1) lights up.  
All other LEDs (except for automatic operation LED 4) light up as lamp test.
2. Check that load/unload switch (9) is pointing downwards (position Unload) and press reset/start button (10). After starting, all LEDs are out except for:
  - Voltage on LED (1)
  - Automatic operation LED (4)

#### Number of starts

Observe an interval of 20 minutes between each start to limit the temperature rise in the motor windings.

3. Open the air outlet valve (customer's installation).
4. Move load/unload switch (9) upwards (position Load) to load the compressor.

#### Important

If the motor is stopped and automatic operation LED (4) is alight, the motor may start automatically.

#### 3.4.2 During operation (Fig. 1.8)

1. When automatic operation LED (4) is alight, starting and stopping of the motor are automatically controlled: when the motor is stopped, it may restart automatically.
2. Check the readings on the gauges (Fig. 1.9). See section 7.1.

#### Manual unloading/loading

To unload the compressor manually, move switch (9) downwards; to load the compressor manually, move switch (9) upwards.

#### 3.4.3 Stopping (Fig. 1.8)

1. Move load/unload switch (9) downwards to unload the compressor.
2. Wait a few seconds and then press stop button (11).
3. Close the air outlet valve.
4. Open the drain valves (2 and 4-Fig. 1.3).

### 3.5 Taking out of operation

At the end of the service life of the compressor, proceed as follows:

1. Close the air outlet valve and stop the compressor.
2. Switch off the voltage and disconnect the compressor from the mains.

3. Shut off and depressurise the part of the air net which is connected to the outlet valve. Disconnect the compressor air outlet pipe from the air net.
4. Drain the oil and condensate circuits.
5. Disconnect the compressor condensate piping from the condensate drain net.

---

#### Footnotes chapter 3

- 1) If the <<Load>> or <<Unload>> function is not indicated on the bottom line of display (4), press key <<Menu>> (5) until the function <<Main Screen>> appears above key (F1), then press the key <<Main Screen>>.
- 2) If the function <<Show More>> is not indicated on the bottom line of display (4-Fig. 1.4), press key <<Menu>> (5) until function <<Main Screen>> appears above key (F1), then press the key <<Main Screen>>.
- 3) The compressor is automatically started and stopped if these start/stop commands are programmed and activated; consult section 1.2.1.

## 4 MAINTENANCE

### Attention

Before carrying out any maintenance or repair, stop the compressor. **On ZT with Elektronikon regulator**, wait until the compressor has stopped and press the emergency stop button. Switch off the voltage. Safeguard against unintentional "switch-on". Apply all relevant safety precautions, including those mentioned in this book.

### 4.1 Preventive maintenance schedule for the compressor 1)

The schedule contains a summary of the maintenance instructions. Read the related section before taking maintenance measures.

In servicing, replace all removed gaskets, O-rings and washers.

The "longer interval" checks must also include the "shorter interval" checks.

Period 2)	Running hours 2)	Consult section	See note	Operation
<b>Daily</b>	--	--	1	Check oil level
"	<b>8</b>	3.3/3.4/7.1	--	Check readings on display or gauges
"	<b>8</b>	--	--	Check that condensate is discharged from the drain receivers during loading
"	--	3.3/3.4	--	Drain the aftercooler and intercooler drain receivers after stopping
<b>Weekly</b>	--	7.2	2	Check programmed settings
"	--	--	--	Drain condensate from air receiver, if installed
"	--	--	4	Check for possible leaks
<b>6-monthly</b>	<b>4000</b>	4.5/5.1	5	Remove air filter, clean by air jet and inspect
"	--	--	--	Clean compressor
<b>Yearly</b>	<b>8000</b>	--	--	Replace filter of gear casing breather
"	<b>8000</b>	--	2	Carry out a LED/display test
"	<b>8000</b>	4.5/5.2	--	Replace oil filter
"	--	4.5/5.1	--	Replace air filter
"	--	5.3	--	Inspect coolers for cleanliness
"	--	5.4	3	Have safety valves tested
"	--	--	--	Have the compressor inspected by an Atlas Copco Service representative
"	--	--	3	On Arr. 1, check motor alignment
"	--	--	--	Have operation of sensors, electrical interlockings and components tested by an electrician
<b>2-yearly</b>	<b>16000</b>	4.3/5.2	--	If Roto-Z is used, change oil

### Notes

1. When stopped, the level must be around the MAX mark of the oil level sight-glass; during operation, the level will be in the MIN range.
2. For compressors with Elektronikon regulator only. See "User manual for Elektronikon® regulator".
3. Preferably to be carried out by an Atlas Copco Service representative.
4. Any leak should be attended to immediately.
5. In very dusty surroundings it may be necessary to check and replace the air filters more frequently. Consult Atlas Copco.

## 4.2 Motor greasing

It is strongly recommended to use Atlas Copco Roto-Glide grease to ensure trouble-free operation.

Atlas Copco grease cartridges can be ordered using following ordering numbers:

Cartridge	2908 8514 00
Grease pump	2908 8513 00

Stop the compressor before greasing. **On compressors with Elektronikon regulator**, reset the regreasing service warning **3)** after regreasing. The data below are valid for an air intake temperature of maximum 40 degrees Celsius.

### 50 Hz compressors

Compressor type	Motor type	Interval (hours)	Qty (g)
ZT110	SIEMENS 1LA6-310-2	2000	20
ZT132	SIEMENS 1LA6-313-2	2000	20
ZT145	SIEMENS 1LA6-316-2	2000	20
ZT160	SIEMENS 1LA6-316-4	4000	20
ZT200	SIEMENS 1LA6-317-4	4000	20
ZT250	SIEMENS 1LA8-315-4	8000	40

### 60 Hz compressors

Compressor type	Motor type	Interval (hours)	Qty (g)
ZT110	SIEMENS 1LA6-310-2	2000	20
ZT145	SIEMENS 1LA6-316-2	2000	20
ZT160	SIEMENS 1LA6-316-4	4000	20
ZT200	SIEMENS 1LA6-317-4	4000	20
ZT250	SIEMENS 1LA8-315-4	8000	40
ZT275	SIEMENS 1LA8-317-4	8000	40

## 4.3 Oil specifications

### Roto-Z lubricating oil

It is strongly recommended to use Atlas Copco Roto-Z oil, which is specially developed for oil-free rotary compressors. This oil has a long service life and ensures optimum lubrication.

Atlas Copco Roto-Z oil can be ordered in following quantities:

Quantity	Ordering number
5 l can	2908 8503 00
20 l can	2908 8501 01
209 l drum	2908 8500 00

## 4.4 Storage after installation

Run the compressor, e.g. twice a week, until warm. Load and unload the compressor a few times.

If the compressor is going to be stored without running from time to time, protective measures must be taken. Consult Atlas Copco.

## 4.5 Service kits

### Service kits

Service kits comprise all parts needed for servicing components and offer the benefits of genuine Atlas Copco parts while keeping the maintenance budget low. All service kits are mentioned in the relevant Parts Lists.

**For ZT110-145**, use following service kit for the oil filter and air filter:

Service kit for oil filter and air filter: 2906 0377 00

**For ZT160-275**, use following service kit for the oil filter and air filter:

Service kit for oil filter and air filter: 2906 0393 00

### Footnotes chapter 4

- 1) Use only authorised parts. Any damage or malfunction caused by the use of unauthorised parts is not covered by Warranty or Product Liability.**
- 2) Whichever interval comes first.** The local Atlas Copco Sales Company may overrule the maintenance schedule, especially the service intervals, depending on the environmental and working conditions of the compressor.
- 3) See "User manual for Elektronikon® regulator", section "Service submenu".**

## 5 SERVICING PROCEDURES

### 5.1 Air filter

1. The filter must be serviced yearly, or if the service warning appears on display (4-Fig. 1.4) or if the pressure drop reaches 45 mbar on gauge (9-Fig. 1.9).
2. Stop the compressor and **for ZT with Elektronikon regulator**, press the emergency stop button (S2-Fig. 1.4). Switch off the voltage.
3. Remove the filter. If necessary, clean the filter chamber.
4. Install the new or cleaned filter. Never install damaged or clogged filters.
5. Switch on the voltage. **For ZT with Elektronikon regulator**, unlock the emergency stop button and reset the air filter service warning. 1)

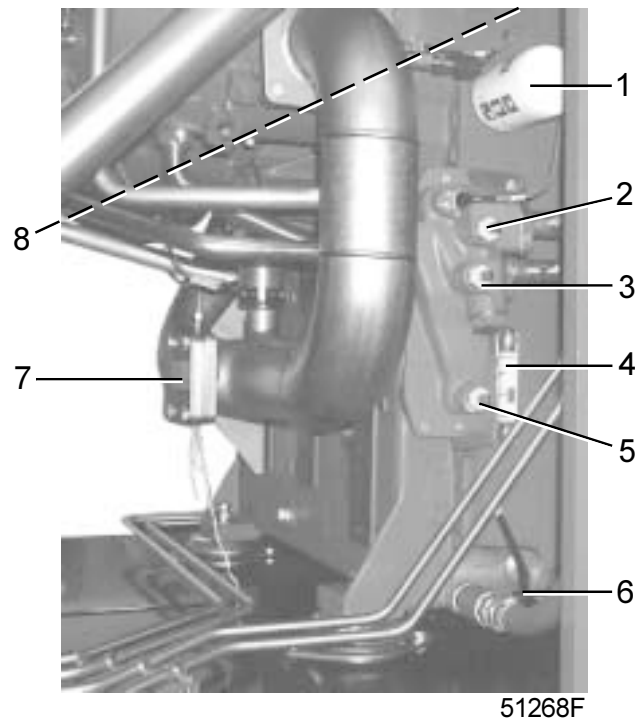
### 5.2 Oil and oil filter change (Fig. 5.1)

1. Run the compressor until warm. Stop the compressor **and for ZT with Elektronikon regulator**, press the emergency stop button. Switch off the voltage.
2. Remove filler plug (8).
3. Drain the oil system by opening drain valve (6).
4. Push a proper flexible over the extension of drain plug (2), loosen the plug to allow the oil to be drained.
5. Repeat the above-mentioned procedure for drain plugs (3 and 5).
6. Close valve (6) and tighten drain plugs (2, 3 and 5).
7. Remove the oil filter (1). Clean the filter seat, oil the gasket of the new filter and screw it into place until the gasket contacts the seat. Then tighten by hand.
8. Fill the compressor sump to the MAX mark of the oil level sight-glass (4) with oil as specified in section 4.3. Reinstall the filler plug.
9. Switch on the voltage. **For ZT with Elektronikon regulator**, unlock the emergency stop button and reset the oil and oil filter service warnings. 1)

### 5.3 Coolers

Keep the coolers clean to maintain the cooling efficiency. The intervals between cleaning operations depend on the working conditions. Stop the compressor, press the emergency stop button and switch off the voltage. Use an air hose with suitable nozzle to remove dirt from the cooler pipes and surface. Do not use metal objects. If it should be necessary to wash the coolers with a cleansing agent, consult Atlas Copco.

To facilitate the access to the cooler block, some baffles can be hinged away after loosening bolts (A) one turn and unscrewing bolts (B). The sequence, rotation direction and position of the bolts are shown on Fig. 5.2. Refit the baffles in their original positions after cleaning.



- |   |  |
|---|--|
| 1 | Oil filter   |
| 2 | Oil drain plug                                       |
| 3 | Oil drain plug                                       |
| 4 | Oil level sight-glass                                |
| 5 | Oil drain plug                                       |
| 6 | Oil drain valve, gear casing                         |
| 7 | Flange, connection regeneration air pipe of MD dryer |
| 8 | Oil filler plug                                      |

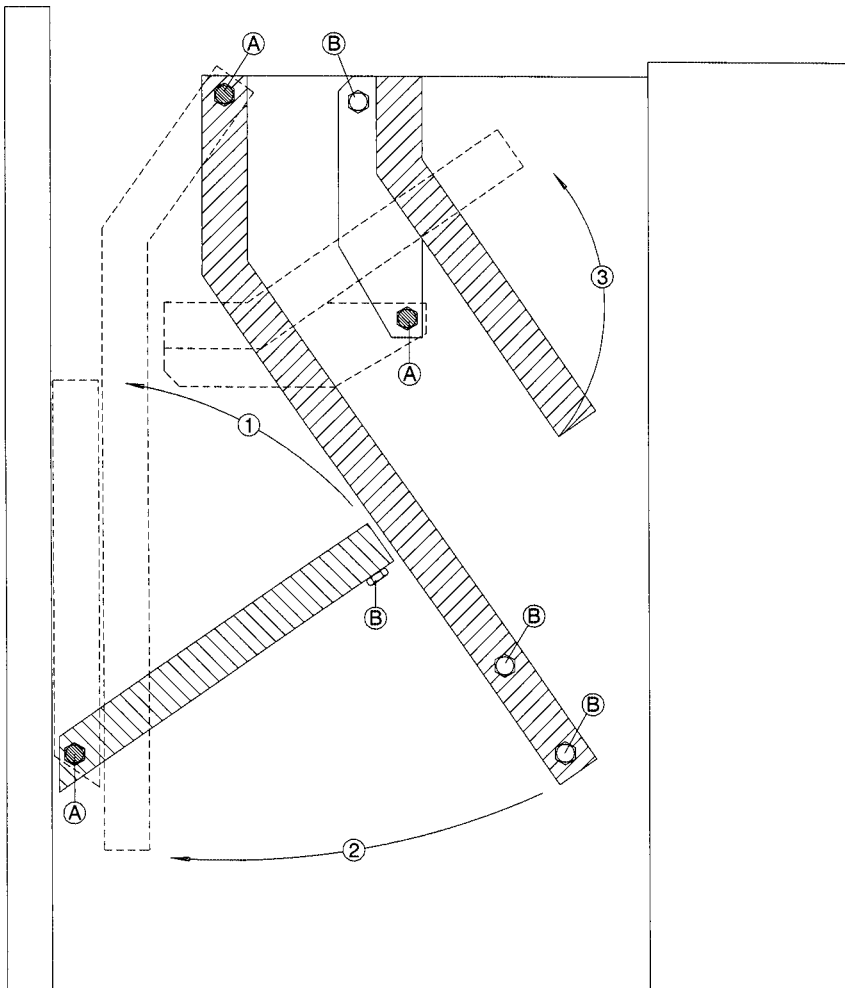
Fig. 5.1 Oil system components

### 5.4 Safety valves

#### Testing

The valves can be tested on a separate compressed air line. If a valve does not open at the pressure specified in section 7.3, consult Atlas Copco.

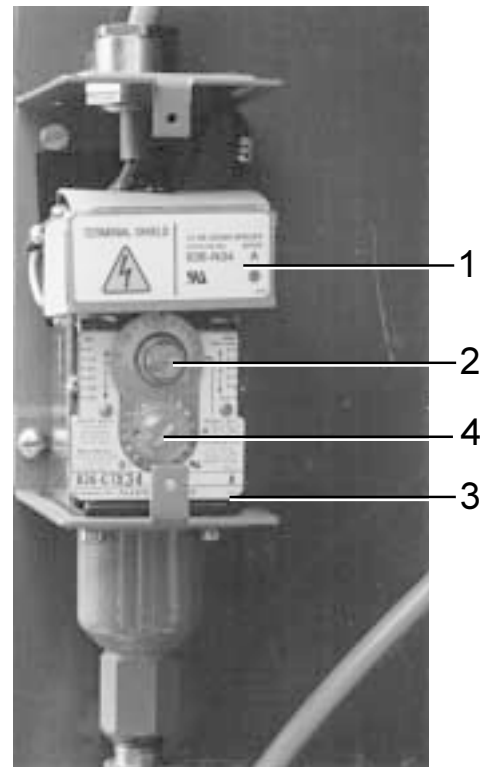
- Warning**
- Never run the compressor without safety valves.
  - No adjustments are allowed.



- A Bolts, to be loosened one turn
- B Bolts, to be removed

Fig. 5.2 Air baffles at cooler block side

51276D



F4061

- 1 Protecting cap
- 2 Adjusting screw, unloading pressure
- 3 Spring housing
- 4 Adjusting screw, pressure difference

Fig. 5.3 Detail of air pressure switch

### 5.5 Setting of air pressure switch (ZT with electropneumatic regulator only)

The switch (Fig. 5.3) allows the operator to select the unloading pressure and the pressure difference between the unloading and loading pressures.

**Warning**

Never remove protecting cap (1) with the power switched on.

**The unloading pressure** is controlled by adjusting screw (2). Turn the screw clockwise to raise the unloading pressure or anti-clockwise to lower it. Never set the unloading pressure at a pressure higher than the maximum working pressure mentioned in section 7.5.

**The pressure difference** is controlled by adjusting screw (4). Turn the screw clockwise to reduce the pressure difference or anti-clockwise to increase it. Recommended minimum pressure difference: 0.6 bar (9 psi).

**Footnotes chapter 5**

- 1) See "User manual for Elektronikon® regulator", section "Service submenu".

## 6 PROBLEM SOLVING

**Warning** Before starting any maintenance or repairs, press stop button (9-Fig. 1.4 or 11-Fig. 1.8); on ZT with Elektronikon regulator, wait until the compressor has stopped and press emergency stop button (S2-Fig. 1.4). Switch off the voltage.

Take precautions to avoid an accidental restart. Apply all relevant safety precautions, including those mentioned in this book.

### Faults and suggested remedies

1. **Compressor starts running, but does not load after a delay time**
    - a. Pressure in air net is above pre-set loading pressure
    - a. Compressor will load when pressure in air net drops to pre-set loading pressure
    - b. Loading solenoid valve inoperative
    - b. Check; if necessary, replace valve
    - c. Full-load/no-load valve malfunctioning
    - c. Have valve inspected
  2. **Compressor capacity or working pressure lower than normal**
    - a. Air consumption exceeds capacity of compressor
    - a. Check pneumatic plant
    - b. Safety valves leaking
    - b. Remove leaking valve and have it inspected
    - c. Unloading pressure incorrectly set
    - c. **For ZT with Elektronikon regulator:** see "User manual for Elektronikon® regulator", section "Modify settings submenu"
    - For ZT with electropneumatic regulator:** see section 5.5
  3. **Oil pressure too low**
    - a. Oil level too low
    - a. Top up level to the MAX mark of the oil level sight-glass
    - b. Oil filter clogged
    - b. Replace filter
  4. **Air temperature above normal**
    - a. Inlet temperature too high due to bad room ventilation or recirculation of cooling air
    - a. Improve ventilation of compressor room and avoid cooling air recirculation
    - b. Fan motor shut down
    - b. Check fan and setting of circuit breaker
    - c. Cooler block dirty
    - c. Clean, see section 5.3
  5. **Compressor is shut down**

**For ZT with Elektronikon regulator:**  
LED (3-Fig. 1.4) will blink indicating that the compressor is stopped due to a shut-down function. A message appears on the display. Remedy the trouble. Consult the "User manual for Elektronikon® regulator" to reset the message (section "Status data submenu")

**For ZT with electropneumatic regulator:**  
One of the fault indicator LEDs is lit indicating the cause of the problem. Remedy the trouble.

**For ZT with Elektronikon regulator only**
  6. **A service message appears on display (4-Fig. 1.4)**  
Replace the indicated component, change the oil or grease the drive motor as the case may be. Consult the "User manual for Elektronikon® regulator" to reset the message (section "Service submenu")
  7. **A shut-down warning message appears on display (4-Fig. 1.4)**  
LED (3-Fig. 1.4) will light up indicating that a shut-down level is almost reached. Consult the "User manual for Elektronikon® regulator" to look for the cause (section "Status data submenu"). Remedy the trouble. The warning message disappears as soon as the cause of the trouble is remedied
- For ZT with electropneumatic regulator only**
8. **Compressor stops after approx. 20 seconds and low oil pressure LED (2-Fig. 1.8) is lit**
    - a. Oil pressure too low
    - a. See step 3
    - b. Time relay (K12) incorrectly set
    - b. Set relay at 20 seconds
  9. **Wrong motor stopping delay**  
Time relay (K10) to stop motor after a period of uninterrupted unloaded running incorrectly set  
Set relay at 20 minutes
  10. **Wrong motor start prevention delay**  
Time relay (K14) to prevent motor from restarting shortly after stopping incorrectly set  
Set relay at 5 seconds



## 7 PRINCIPAL DATA

### 7.1 Readings on display (Fig. 1.4) or on gauges (Fig. 1.9) 1)

The readings below are valid when operating at reference conditions (section 7.5.1):

- Maximum working pressure . . . . . See sections 7.5.3 up to 7.5.6
- Outlet pressure . . . . . Depends on compressor type
- dP air filter . . . . . Below 0.044 bar
- Intercooler pressure . . . . . 1.9-2.5 bar(e) 2)
- Oil pressure . . . . . 2-2.5 bar(e)
- Oil temperature . . . . . Approx. 50 degrees Celsius
- Air temperature, low-pressure element (element 1) out . . . . . 160-185 degrees Celsius 2)
- Air temperature, high-pressure element (element 2) out . . . . . 140-185 degrees Celsius 2)
- Air temperature, high-pressure element (element 2) in . . . . . 25-30 degrees Celsius 2)
- Air outlet temperature . . . . . Approx. 27 degrees Celsius 2)

### 7.2 Regulation - protection - service settings

#### 7.2.1 Programmable settings for ZT with Elektronikon regulator

A number of regulation settings (e.g. loading and unloading pressures), protection settings (e.g. shut-down level for the temperatures of the compressor elements) and service settings (e.g. oil service life) are programmable. The protection settings are the same as given in section 7.2.2.

The "User manual for Elektronikon® regulator" deals elaborately with this matter (section "Modify settings submenu").

#### 7.2.2 Shut-down settings for ZT with electropneumatic regulator

- Oil pressure . . . . . 1.2 bar(e)
- Oil temperature . . . . . 70 degrees Celsius
- Air temperature, low-pressure element (element 1) out
  - Compressors with max. working pressure(e) up to 8.6 bar . . . . . 220 degrees Celsius
  - Compressors with max. working pressure(e) above 8.6 bar . . . . . 235 degrees Celsius
- Air temperature, high-pressure element (element 2) out
  - Compressors with max. working pressure(e) up to 8.6 bar . . . . . 220 degrees Celsius
  - Compressors with max. working pressure(e) above 8.6 bar . . . . . 235 degrees Celsius
- Air temperature, high-pressure element (element 2) in . . . . . 70 degrees Celsius

### 7.3 Settings of safety valves

Safety valves	Opening pressure bar(e)
Low-pressure safety valve(s) . . . . .	3.7
High-pressure safety valve:	
- Compressors with max. working pressure(e) up to 8.6 bar . . . . .	9.3
- Compressors with max. working pressure(e) above 8.6 bar . . . . .	11

## 7.4 Motor type - settings of overload relay - main fuses

### 7.4.1 Setting of overload relay – fuses for 50 Hz compressors

Compressor type	Motor type SIEMENS	Supply voltage (V)	Maximum setting of overload relay (A)	Maximum fuse ratings gL/gG Type 2 3) (A)	Maximum fuse ratings gL/gG Type 1 4) (A)
ZT110	1LA6 310-2	230	206	2x (3x224)	3x400
		400	118	3x224	3x315
		500	95	3x200	3x250
ZT132	1LA6 313-2	230	248	2x (3x250)	3x500
		400	143	3x250	3x400
		500	113	3x224	3x315
ZT145	1LA6 316-2	230	266	2x (3x300)	3x500
		400	153	2x (3x200)	3x400
		500	124	2x (3x224)	3x315
ZT160	1LA6 316-4	230	308	2x (3x300)	3x800
		400	178	2x (3x200)	3x355
		500	143	3x250	3x315
ZT200	1LA6 317-4	230	381	2x (3x400)	3x800
		400	219	2x (3x250)	3x500
		500	178	2x (3x200)	3x355
ZT250	1LA8 315-4AB	230	475	2x (3x500)	3x800
		400	273	2x (3x300)	3x500
		500	219	2x (3x250)	3x500

### 7.4.2 Setting of overload relay – fuses for 60 Hz compressors

Compressor type	Motor type SIEMENS	Supply voltage (V)	Maximum setting of overload relay (A)	Maximum fuse ratings CSA HRC (A)	Maximum fuse ratings UL Class K5 (A)	Maximum fuse ratings CSA HRC (A)	Maximum fuse ratings UL Class K5 (A)
ZT110	1LA6 310-2	220-230	239	2x (3x250)	2x (3x250)	--	--
		380	139	2x (3x200)	2x (3x200)	3x300	3x300
		440-460	119	2x (3x150)	2x (3x150)	3x250	3x200
		575	91	3x200	3x175	--	--
ZT145	1LA6 316-2	220-230	302	2x (3x300)	2x (3x300)	--	--
		380	176	2x (3x200)	2x (3x200)	3x300	3x300
		440-460	153	2x (3x175)	2x (3x175)	3x250	3x200
		575	115	3x200	3x175	--	--
ZT160	1LA6 316-4	220-230	312	2x (3x300)	2x (3x300)	--	--
		380	181	2x (3x200)	2x (3x200)	3x300	3x300
		440-460	157	2x (3x200)	2x (3x200)	--	--
		575	122	3x200	3x175	--	--
ZT200	1LA6 317-4	220-230	385	2x (3x400)	2x (3x400)	--	--
		380	222	2x (3x225)	2x (3x225)	--	--
		440-460	193	2x (3x200)	2x (3x200)	--	--
		575	150	2x (3x175)	2x (3x175)	3x300	3x300
ZT250	1LA8 315-4	220-230	486	2x (3x500)	2x (3x500)	--	--
		380	269	2x (3x300)	2x (3x300)	--	--
		440-460	233	2x (3x250)	2x (3x250)	--	--
		575	176	2x (3x200)	2x (3x200)	3x300	3x300
ZT275	1LA8 317-4	380	312	2x (3x350)	2x (3x350)	--	--
		440-460	269	2x (3x300)	2x (3x300)	--	--
		575	206	2x (3x225)	2x (3x225)	--	--

According to IEC947-4-1 and DIN VDE 0660 Part 102.

### 7.4.3 Setting of fan motor circuit breaker for 50 Hz compressors

Compressor type	Supply voltage (V)	Maximum setting of circuit breaker (A)
ZT110-145	200	30
	230	25.5
	400	14.5
	500	12
ZT160-250	200	57
	230	49.5
	400	28.5
	500	23

### 7.4.4 Setting of fan motor circuit breaker for 60 Hz compressors

Compressor type	Supply voltage (V)	Maximum setting of circuit breaker (A)
ZT110-145	220-230	32
	380	18
	440-460	15
	575	12
ZT160-275	220-230	57
	380	35
	440-460	30
	575	23

## 7.5 Compressor specifications

### 7.5.1 Reference conditions

Absolute inlet pressure . . . . .	bar(a)	1
Relative air humidity . . . . .	%	0
Air inlet temperature . . . . .	°C	20
Nominal effective working pressure . . . . .	bar(e)	see sections 7.5.3 up to 7.5.6

### 7.5.2 Limitations

Maximum air inlet temperature . . . . .	°C	40
Minimum ambient temperature . . . . .	°C	0
Maximum effective working pressure . . . . .	bar(e)	see sections 7.5.3 up to 7.5.6

**7.5.3 ZT110 up to ZT250 7.5 bar - 50 Hz 1)**

	ZT110	ZT132	ZT145	ZT160	ZT200	ZT250
Maximum working pressure . . . . . bar(e)	7.5	7.5	7.5	7.5	7.5	7.5
Nominal working pressure . . . . . bar(e)	7	7	7	7	7	7
Air temperature at outlet valve, approx. °C	26	27	27	27	27	28
Motor shaft speed . . . . . r/min	2980	2980	2980	1485	1485	1485
Power input at maximum working pressure . . . . . kW	128	149	161	188	228	296
Oil capacity . . . . . l	49	49	49	85	85	85
Sound pressure level, Arr. E 5)						
- without silencer . . . . . dB(A)	78	78	78	80	80	81
- with optional silencer . . . . . dB(A)	-	-	-	76	76	76

**7.5.4 ZT110 up to ZT250 10 bar - 50 Hz 1)**

	ZT110	ZT132	ZT145	ZT160	ZT200	ZT250
Maximum working pressure . . . . . bar(e)	10	10	10	10	10	10
Nominal working pressure . . . . . bar(e)	9	9	9	9	9	9
Air temperature at outlet valve, approx. °C	26	27	27	27	27	28
Motor shaft speed . . . . . r/min	2980	2980	2980	1485	1485	1485
Power input at maximum working pressure . . . . . kW	124	144	154	190	233	295
Oil capacity . . . . . l	49	49	49	85	85	85
Sound pressure level, Arr. E 5)						
- without silencer . . . . . dB(A)	78	78	78	80	81	82
- with optional silencer . . . . . dB(A)	-	-	-	76	76	77

**7.5.5 ZT110 up to ZT275 125 psi - 60 Hz 1)**

	ZT110	ZT145	ZT160	ZT200	ZT250	ZT275
Maximum working pressure . . . . . bar(e)	8.6	8.6	8.6	8.6	8.6	8.6
Nominal working pressure . . . . . bar(e)	7	7	7	7	7	7
Air temperature at outlet valve, approx. °C	26	27	27	27	27	28
Motor shaft speed . . . . . r/min	3570	3570	1780	1780	1780	1780
Power input at maximum working pressure . . . . . kW	137	174	178	215	263	316
Oil capacity . . . . . l	49	49	85	85	85	85
Sound pressure level, Arr. E 5)						
- without silencer . . . . . dB(A)	78	78	80	81	81	81
- with optional silencer . . . . . dB(A)	-	-	76	76	76	76

## 7.5.6 ZT110 up to ZT275 150 psi - 60 Hz 1)

	ZT110	ZT145	ZT160	ZT200	ZT250	ZT275
Maximum working pressure . . . . . bar(e)	10.4	10.4	10.4	10.4	10.4	10
Nominal working pressure . . . . . bar(e)	9	9	9	9	9	9
Air temperature at outlet valve, approx. °C	27	27	27	27	27	28
Motor shaft speed . . . . . r/min	3570	3570	1780	1780	1780	1780
Power input at maximum working pressure . . . . . kW	137	159	182	215	256	294
Oil capacity . . . . . l	49	49	85	85	85	85
Sound pressure level, Arr. E 5)						
- without silencer . . . . . dB(A)	78	78	81	81	82	82
- with optional silencer . . . . . dB(A)	-	-	76	76	77	77

## 7.6 Conversion list of SI units into British/American units

1 bar = 14.504 psi

1 g = 0.035 oz

1 kg = 2.205 lb

1 km/h = 0.621 mile/h

1 kW = 1.341 hp (UK and US)

1 l = 0.264 US gal

1 l = 0.220 Imp gal (UK)

1 l = 0.035 cu.ft

1 m = 3.281 ft

1 mm = 0.039 in

1 m<sup>3</sup>/min = 35.315 cfm

1 mbar = 0.401 in wc

1 N = 0.225 lbf

1 Nm = 0.738 lbf.ft

x degrees Celsius = (32 + 1.8 x) degrees Fahrenheit 6)

### Footnotes chapter 7

- 1) At reference conditions.
- 2) Depends on compressor type.
- 3) No damage will occur at the overload relay.
- 4) Disturbance or destruction of contactor and/or overload relay may occur (if damaged, the component must be replaced).
- 5) According to PNEUROP PN8NTC2.2 under free field conditions at 1 m distance.
- 6) A temperature difference of 1 degrees Celsius = a temperature difference of 1.8 degrees Fahrenheit.

## 8 OPTIONAL EQUIPMENT (STANDARD OPTIONS)

Atlas Copco offers following equipment as standard options:

### 8.1 Electropneumatic control system

This control system includes a relay-controlled regulator with control panel and instrument panel. The function of the regulator and the operating instructions for compressors equipped with this regulator are described in sections 1.3 and 3.4 respectively.

### 8.2 Continuous capacity control system (Fig. 8.1)

The continuous capacity control system is recommended for installations where it is desired to operate with smaller pressure fluctuations than with the standard full-load/no-load regulating system.

The system continuously controls the air output of the compressor between the full-rated capacity of the compressor and a minimum capacity, matching the air output to the air consumption.

The system includes:

- Pressure controller (34)
- Control valve (30)
- Pressure reducing valve (39) for unloader (4)
- Pressure reducing valve (31) for controller (34)
- Check valve (40)
- Silencer (32)

#### Operation

Controlling of the compressor capacity is accomplished by blowing off air from downstream of the intercooler to the compressor inlet.

Any change in compressor outlet pressure is sensed by the Bourdon tube (38) of pressure controller (34) and converted by the controller into a change in output pressure (35) towards control valve (30):

- any decrease in compressor outlet pressure causes control valve (30) to close more, resulting in a higher compressor output
- any increase in compressor outlet pressure causes control valve (30) to open more, resulting in a lower compressor output

When the controller reaches its maximum output pressure (35), control valve (30) is at its maximum open position and consequently the compressor output is at minimum and the intercooler pressure at minimum.

If the net pressure continues to rise, the compressor will be unloaded (0% output) at the pre-set unloading pressure. If the net pressure decreases again, the compressor will be loaded (100% output) at the pre-set loading pressure (see Fig. 8.2).

The controller (34) is provided with following setting knobs:

- pressure setting knob (37) to adjust the requested system pressure which is to be controlled (note that the dial setting and actual system pressure may vary, especially with a wide proportional band setting)
- proportional band setting knob (36) which determines the amount of change in controlled pressure required to cause control valve (30) to stroke fully

#### Important

- The minimum intercooler pressure is limited and defined by the working pressure and the maximum pressure ratio over the high-pressure compressor element.
- The compressors are adjusted ex-factory. Local adjustments may only be carried out by an Atlas Copco representative to obtain optimum efficiency of the regulation and to avoid possible damage caused by too low an intercooler pressure.

### 8.3 Other optional equipment

#### ANSI flanges

The flanges on the air pipes can be provided with ANSI flanges instead of DIN flanges.

#### Motor temperature protection

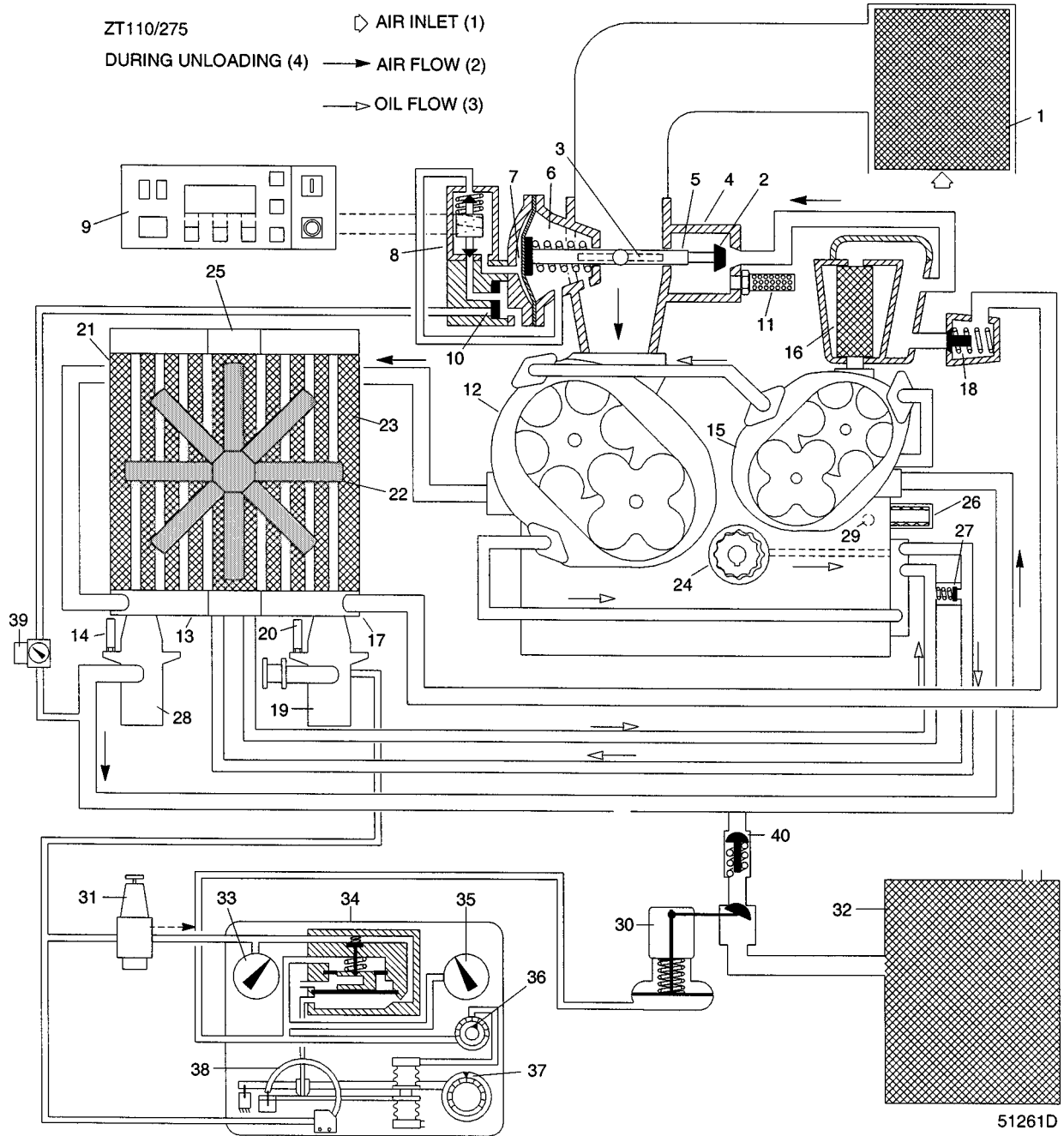
Temperature sensors (thermistors) can be embedded in the windings of the drive motor to warn the operator if the winding temperature becomes too high and to shut down the compressor, thus protecting the motor from overheating.

#### Teflon-free compressor elements

The rotors of the compressor elements can be provided with an epoxy-based coating.

#### Hot air version

The cooling system can be adapted in order not to cool the outgoing compressed air.



- |    |                                 |    |                                  |    |  |
|----|---------------------------------|----|----------------------------------|----|--|
| 1  | Air filter(s)                   | 15 | High-pressure compressor element | 29 | Oil circuit by-pass valve                        |
| 2  | Unloading valve                 | 16 | Silencer                         | 30 | Control valve                                    |
| 3  | Full-load/no-load valve         | 17 | Pre-aftercooler                  | 31 | Pressure reducing valve, control valve           |
| 4  | Unloader                        | 18 | Check valve                      | 32 | Silencer   |
| 5  | Plunger                         | 19 | Moisture trap, aftercooler       | 33 | Supply pressure gauge                            |
| 6  | Chamber                         | 20 | High-pressure safety valve       | 34 | Pressure controller                              |
| 7  | Chamber                         | 21 | Intercooler                      | 35 | Output pressure gauge                            |
| 8  | Loading solenoid valve          | 22 | Fan                              | 36 | Proportional band setting knob                   |
| 9  | Elektronikon® regulator         | 23 | Aftercooler                      | 37 | Pressure setting knob                            |
| 10 | Diaphragm                       | 24 | Oil pump                         | 38 | Bourdon tube                                     |
| 11 | Silencer                        | 25 | Oil cooler                       | 39 | Pressure reducing valve, full load/no load valve |
| 12 | Low-pressure compressor element | 26 | Oil filter(s)                    | 40 | Check valve                                      |
| 13 | Pre-intercooler                 | 27 | By-pass valve                    |    |  |
| 14 | Low-pressure safety valve(s)    | 28 | Moisture trap, intercooler       |    |  |

Fig. 8.1 Regulating system ZT110-275, continuous capacity control

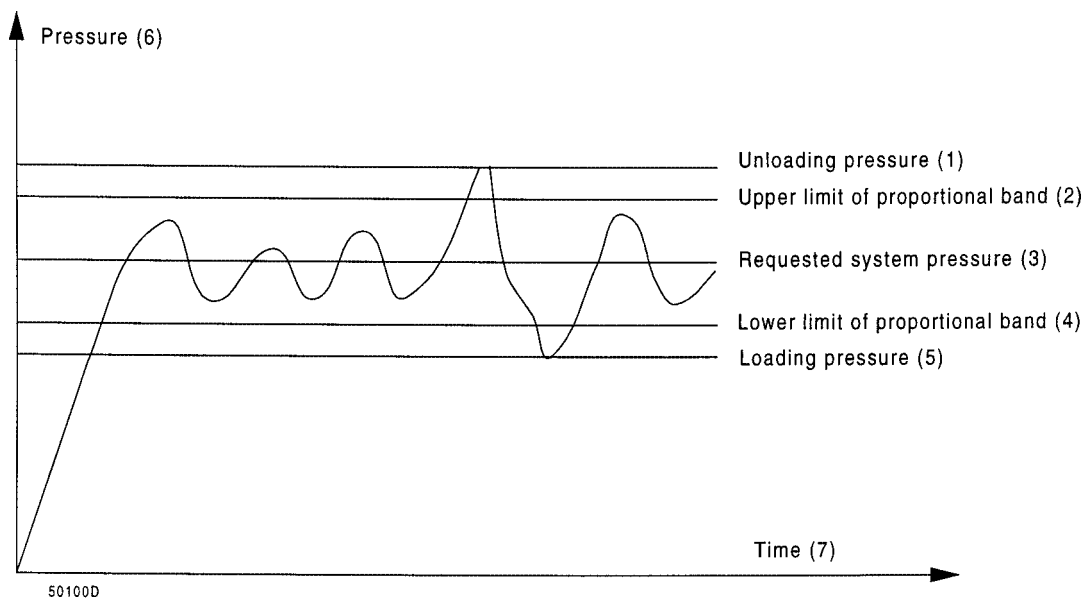


Fig. 8.2 Example of pressure/time diagram

**Example:**

The pressure controller has a 0-200 psi Bourdon tube and is adjusted for a requested system pressure of 102 psig (7 bar effective). The dial of knob (36) has a range from 0 to 10 corresponding to a proportional band setting of 0% to 100%. If the knob is set at 0.3 (which corresponds to a proportional band setting of  $\pm 3\%$ ), control valve (30) will be fully open at 105 psig (7.2 bar effective) and fully closed at 99 psig (6.8 bar effective).