



ASPC Project



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CONTRACTOR	: DYPNF Co., Ltd.
VENDOR NAME	: Airpack Netherlands BV
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1 General

1.1 General description

This document describes the operating and control narrative of the 11 compressors and blowers as described below.

2 Nitrogen oil free screw compressors, discharge pressure and flow 2.903 bara and 6255 nm³/h. (44C-40001A/B)

2 Air oil free screw compressors, discharge pressure and flow 2.473 bara and 4175 nm³/h. (44C-80001A/B)

2 Air roots blowers, discharge pressure and flow 1.983 bara and 4257 nm³/h. (44C-80002A/B)

2 Air oil free screw compressors, discharge pressure and flow 3.213 bara and 7185 nm³/h. (44C-80004A/B)

2 Air oil free screw compressors, discharge pressure and flow 2.423 bara and 4095 nm³/h. (44C-80005A/B)

Included is,

2. One (1) Local Pushbutton Station (LPS) per skid, to control the packages locally.
3. One (1) Analog Junction Box (JB) per skid for receiving and sending signals.

1.2 Local pushbutton station and junction box

Please refer to Electrical scheme (3944-VD-0171-DYP-RE-400-DIA-0002), Wiring Diagram for LPS and Junction Box) and panel layout (3944-VD-0171-DYP-RE-400-DWG-0003), Drawings for LPS and Junction Box for information concerning different lamps and operation buttons.

The Local Control Panel is located on the compressor package (**Explosion proof area for 44C-40001A/B, Safe area for the others**) and connected to the DCS with multipair cable.

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2 Hardware switches and lamps LPS

The following buttons and lamps are provided on every compressor pushbutton station.

Compressor Running Lamp (GREEN)

ON when compressor is running.

Fault lamp (AMBER)

Will blink at unacknowledged alarm(s), steady at acknowledged alarm(s).

Compressor start button

To start the package, via **DCS** controlled sequence.

Compressor stop button

To stop the compressor, via **DCS** controlled sequence.

ESD button

To shut down the package without following the controlled stop sequence.

Lamp test button

To test all the lamps on the LPS.

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3 Compressor controls

The start and stop logic for the compressor will be described in this block, including all timers and the starting and stopping of the motor.

In case of emergency the compressor can always be shut down by pressing the local ESD BUTTON (101HS-03)

3.1 Start-up

The compressor can be started locally on LPS or remote from DCS, depending on the position of the local / remote switch. To initiate operating either the start button (LPS) has to be pressed or remote start from DCS has to be sent and the following starting conditions have to be met (ready to start):

1. No trips and no ESD, 'compressor ready' lamp is on.
2. Minimum run timer is not active (see chapter 3.3 TIMERS).
3. Start-up delay timer is not active (see chapter 3.3 TIMERS).
4. Motor is available, which is not running and not fault Signal from MCC.

After the above start conditions are met, the following functions will be enabled:

- The compressor ready lamp will go on, which means the compressor motor and fan motor are ready to start.
- The start-up delay timer is activated (see chapter 3.3 TIMERS). The operational lamp and running lamp will turn on.
- When the compressor start the minimum run timer will start (see chapter 3.3 TIMERS).
- The compressor keeps running until stop command is given.

3.2 Shutdown

The compressor can have two shut down situations:

1. Planned shutdown.

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2. Unplanned shutdown

3.2.1 planned shutdown

To initiate planned shutdown the 'compressor stop' button on LPS needs to be pushed to receive stop signal or 'compressor stop' signal from DCS via need to be received. The below stop conditions have to be met:

- Minimum run timer is not active (see chapter 3.3 TIMERS).
- Cool down timer is not active (see chapter 3.3 TIMERS).
- When all conditions have been met the compressor will shut down.

During the planned shut down the following functions will be enabled;

- COOL DOWN TIMER (see chapter 3.3 TIMERS) starts.
- Main motor and enclosure fan motor will be stopped.

3.2.2 Unplanned shutdown

In case of a trip or emergency stop button pressure, the compressor motor will shut down immediately, common trip lamp will go on, MINIMUM RUN TIMER and COOL DOWN TIMER are cancelled.

Please be aware that the alarm reset button (HMI) needs to be pressed to restart the compressor after any trip or ESD. This button to reset the alarms should be programmed in the DCS HMI where all the alarms and trips are listed.

After a planned or unplanned shutdown, a RESTART DELAY TIMER (see chapter 3.3 TIMERS). will be active. This is to prevent the motor from starting directly after a stop. The compressor needs to get to a complete standstill before starting it again.

3.3 Timers

MINIMUM RUN TIMER:

- Minimum running time after initial start
- To protect the motor by preventing more than 3 starts per hour
- Duration: 20 minutes

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RESTART DELAY TIMER:

- To let the compressor come to a complete stop
- Prevents the compressor from restarting until a certain time after stopping
- Duration: 1 minute for normal shutdown.

COOL DOWN TIMER:

- Keeps the enclosure fan motor running to cool down the compressor
- Duration: 2 minutes

3.4 Motor control

There are two (3) motors per compressor which require starting, the main motor and enclosure fan motor. These motors are protected in MCC by client.

Both the main and fan motor have the following sequence for starting / stopping:

- The DCS is sending a START signal to Motor Starter Panel (MCC) to start the fan motor except main motor.
- The MCC is returning a RUNNING signal to start main motor.
- The main motor starter of MCC is returning healthy signal to the PLC in the DCS within two seconds. If not, the PLC in DCS will generate a trip.
- In case there is a fault in MCC, the MCC will send a TRIPPED signal to compressor PLC in DCS to trip the compressor.
- The DCS is sending a STOP signal to MCC to stop the motor.
- IN case of a trip for the running compressor the DCS will send a TRIP signal to trip each motor.

When the compressor is started , the fan motor is started, and in sequence the main motor is started. When the compressor is stopped or tripped both the fan and main motor are stopped, or tripped. If fan or main motor is tripped the complete compressor package is tripped.

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3.5 Common alarm and common trip

3.5.1 Common alarm

All alarm and sensor failure will be collected here and put into one common alarm block, if this common alarm is active the COMMON alarm LAMP will blink, this means that a new alarm is present, and the cause should be investigated. The package will continue to run with the alarm; however, the cause of the alarm should be investigated by the operator.

If the COMMON alarm LAMP blinks it needs to be acknowledged by the ACKNOWLEDGE BUTTON in DCS and necessary maintenance must be done according to the maintenance MANUAL. If ACKNOWLEDGE BUTTON in DCS is pressed the COMMON ALARM LAMP will be on steady. If maintenance has been carried out the RESET BUTTON (HMI) can be pressed, COMMON ALARM LAMP should turn off, unless an alarm is still present, the COMMON ALARM LAMP will start blinking again.

3.5.2 Common trip

All trip and sensor failure will be collected here and put into one common trip block, if this common trip is active the COMMON TRIP LAMP will blink, this means that a new trip is present, and the cause should be investigated. The package will stop immediately as described in 3.2.2 UNPLANNED SHUTDOWN on page 6.

If the COMMON TRIP LAMP blinks it needs to be acknowledged by the ACKNOWLEDGE BUTTON in DCS and necessary maintenance must be done according to the maintenance MANUAL. If ACKNOWLEDGE BUTTON in DCS is pressed the COMMON TRIP LAMP will be on steady. If maintenance has been carried out the RESET BUTTON in DCS can be pressed, COMMON TRIP LAMP should turn off, unless a trip is still present, the COMMON TRIP LAMP will start blinking again. In case of a trip the package will stop immediately, all timers (MINIMUM RUN and COOLDOWN) will be cancelled.

Calbe fractures or / and out of range trips shall be monitored by DCS.

3.5.3 Emergency stop functions

An emergency stop can be activated by pressing the local ESD BUTTON (320HS-8203) on compressor LPS or by activation of ESD TRIP SIGNAL (320HS-8206) in DCS.

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An Emergency stop signal activates an ESD relay inside the panel, the ESD relay sends a trip signal to the DCS, causing the compressor to trip. Separately the ESD relay also disconnects power to all the motors in the compressor.

3.5.4 ESD signals

Please find below all ESD signals:

Service	Source	Value 0	Value 1
ESD pushbutton	LPS	Trip	Healthy
ESD trip signal	DCS	Trip	Healthy