

Date of last update: Jul-21

Ref: TI\_Stream\_NGCS\_05\_E\_Rev02

Application Engineering Europe

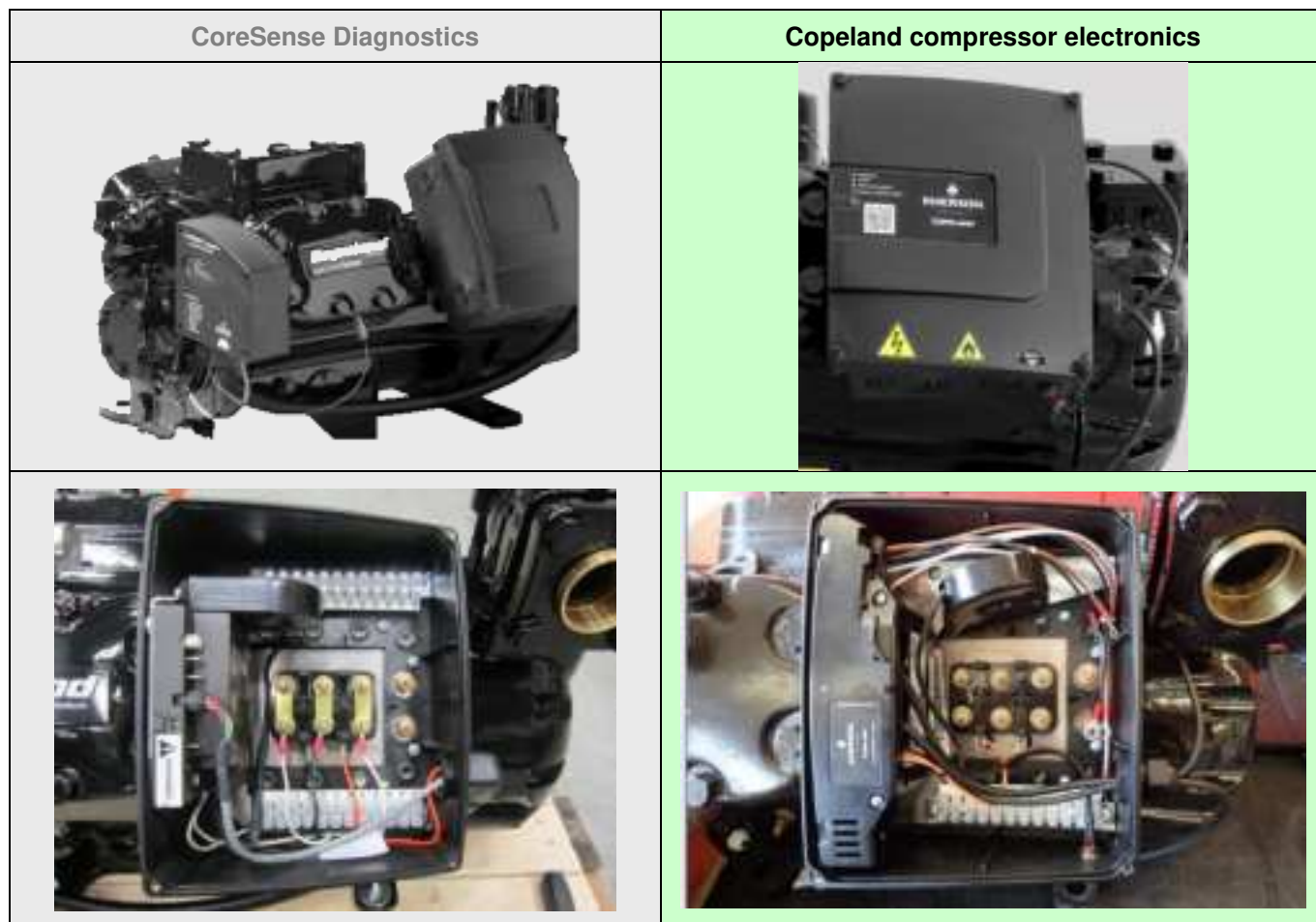
## COPELAND™ COMPRESSOR ELECTRONICS FOR STREAM COMPRESSORS GUIDE FOR THE REPLACEMENT OF CORESENSE™ DIAGNOSTICS

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## 1 Differences between Copeland™ compressor electronics and CoreSense™ Diagnostics

### 1.1 Location

The Copeland compressor electronics (formerly Next Generation CoreSense) module is located in the terminal box of the Stream compressor, whereas the CoreSense Diagnostics module was located outside the terminal box, next to the oil pump. Consequently, the replacement of the CoreSense Diagnostics module with the Copeland compressor electronics module will lead to some cabling modifications.



### 1.2 Sensors and connections

Both modules measure the same type of information, but the sensors can be different or located in different places, and all the connections are different. All the necessary parts are included in the replacement kit.

	CoreSense Diagnostics	Copeland compressor electronics
<b>Oil pressure sensor</b>	Sentronic sensor	OPS3 sensor & switch
<b>Discharge temperature sensor</b>	Sensor located in the cylinder head	
	NTC	PT1000
<b>Current sensor</b>	Located in the terminal box	
<b>Sensor module</b>	Located in the terminal box	NO
<b>Modbus connection</b>	Option	Option via an additional module

### 1.3 Terminal box and cover

The terminal box and its cover have the same dimensions, but they have specific features, so they both need to be replaced.

- The Copeland compressor electronics terminal box has one additional hole for the reset button.
- The Copeland compressor electronics terminal box cover has a window to allow viewing the LEDs.

## 2 Replacing CoreSense Diagnostics with Copeland compressor electronics and accessories



#### WARNING

**High voltage! Danger of electric shock!** Turn off the main power supply to de-energise the compressor before opening the terminal box or undertaking any task on the electrical equipment. Never open the electrical box in rainy weather if the isolating switch is on.

Complete kits for the replacement of CoreSense Diagnostics with Copeland compressor electronics can be ordered with the following references:

- Kit for Stream with oil pump: N° 5406738
- Kit for Stream without oil pump (small CO<sub>2</sub> models): N° 3271343

The kits include all the parts needed for the replacement, including the terminal box and its cover.

For replacement, parts and components that are not required for the Copeland compressor electronics module must be removed and replaced with accessories compatible with the new module.

### 2.1 Parts to be removed

Parts and components that are specific to the CoreSense Diagnostics module have to be removed.

**CoreSense Diagnostics  
control module**

**Sensor module &  
current sensor in T-box**

**Discharge  
temp sensor**

**Oil pressure sensor**

**Wiring harness**

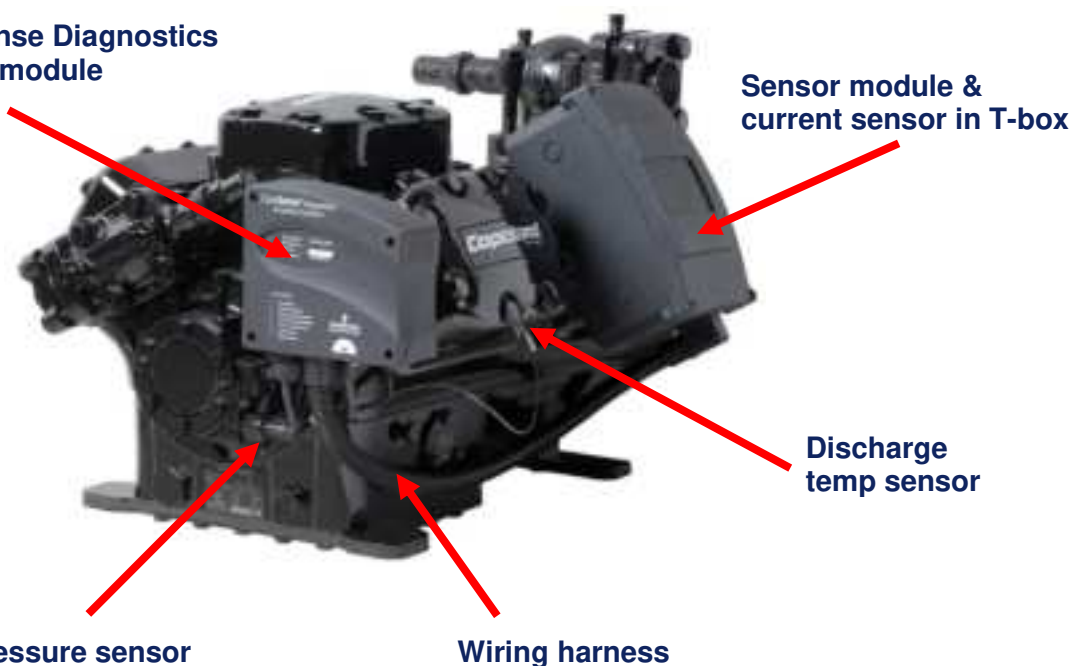


Figure 1: CoreSense Diagnostics module – Main Components

### 2.1.1 Parts in terminal box

The sensor module with its bracket and the current sensor have to be removed:

- 1) Disconnect the main power supply to the compressor.
- 2) Unscrew the 4 screws located in the corners of the terminal box cover and open the cover.
- 3) Disconnect the power supply to the terminal and the 3 voltage sensing leads attached to the motor terminals and connected to the sensor module.
- 4) Disconnect the power supply to the sensor module and all the other connections (crankcase heater, communication to CoreSense Diagnostics module, current sensor).
- 5) Remove the sensor module and the current sensor.



**Figure 2: CoreSense Diagnostics sensor module located in terminal box**

### 2.1.2 External parts

- 1) Remove the CoreSense control module with its bracket.
- 2) Remove the cable harness from the terminal box.
- 3) Remove the terminal box.

### 2.1.3 Sensors in compressor body



#### **CAUTION**

**Contact with POE! Material damage!** POE lubricant must be handled carefully and the proper protective equipment (gloves, eye protection, etc.) must be used at all times. POE must not come into contact with any surface or material that it might damage, including without limitation, certain polymers, eg, PVC/CPVC and polycarbonate.

Both the discharge temperature and the oil pressure differential sensors have to be replaced, which means that the system will have to be opened. Therefore, it is necessary to prepare the compressor according to industry standards first before changing parts.

- 1) Close suction service valve.
- 2) Pump down compressor.
- 3) Disconnect power to compressor.
- 4) Close discharge service valve and oil supply valve (if applicable).
- 5) Depressurize compressor.

**NOTE: Once removed the 2 sensors will have to be replaced immediately with the new ones.**

## 2.2 Installation of the Copeland compressor electronics module

### 2.2.1 Replacement of the oil sensor

- 1) Unscrew the existing oil sensor from the oil pump.
- 2) Remove the yellow cap from the new OPS3 oil sensor.
- 3) Fit the new oil sensor in the oil pump with the copper gasket with a tightening torque of 60 to 75 Nm.
- 4) Remove the white cap and screw the electronic switch (black part) to the brass sensor with a tightening torque of maximum 10 Nm.



Figure 3: OPS3 oil pressure sensor and electronic switch

### 2.2.2 Replacement of the discharge temperature sensor

- 1) Unscrew the discharge sensor from the cylinder head.
- 2) Fit the new discharge temperature sensor in the cylinder head using Loctite or sealing tape on the thread with a tightening torque of 15 Nm.
- 3) Remove the yellow cap and connect the cable to the sensor with a tightening torque of maximum 10 Nm.



Figure 4: Discharge temperature sensor

### 2.2.3 Replacement of the terminal box

Once the terminal is empty, remove it and replace it with the new terminal box.



#### 2.2.4 Parts in terminal box

The current sensor and the Copeland compressor electronics module have to be installed in the terminal box with their own brackets.



Figure 5: Current sensor and Copeland compressor electronics module



Figure 6: Terminal box with Copeland compressor electronics

### 2.2.5 Connections

Once the parts are changed, several cables have to be connected according to the description below.

- Motor PTC cable out of terminals 5 and 6 to S1 and S2 at the terminal plate.
- Current sensor (T1) to terminals 9 and 10 (CM).
- Reset button to terminals 14 and 13 (Reset).
- Discharge gas temperature sensor to terminals 7 and 8 (DGT).
- Oil pressure sensor to terminals 11 and 12 (OPS).
- 2 times 3 cables for each winding, for the phase monitoring to module terminals U1-V1-W1, U2-V2-W2, (PM).
- Earth to PE.
- Power supply (230 or 115 V) to terminals 1 (N) and 2 (L1) (PS), both polarities are possible.
- Crankcase heater to terminals 3 and 4 (CH). Only a crankcase heater with the same power supply as the Copeland compressor electronics module (115 VAC or 230 VAC) can be applied.
- Position of jumper according to starting method and motor type.
- Connect the power supply to the terminal plate. **Caution:** the power leads from the same phase should go through the current sensor in the same direction – see T1 (current sensor) on the electrical diagram.
- Connect the control circuit phase (L) to terminal 19.

See the wiring diagrams for more details.

### 2.2.6 Stream with Copeland compressor electronics – Wiring diagrams



#### IMPORTANT

**For Stream CO<sub>2</sub> small and medium compressor models (4MTL-05 to 4MTL-30 & 4MSL-03 to 4MSL-15), the blue positions 1U, 2V, 3W, 7Z, 8X, 9Y in diagrams below must be considered.** The position of the terminals in all the other Stream compressor models corresponds to the black positions. The factory delivery is correct, DO NOT reverse the connections.

#### Legend

B1..... Discharge gas sensor	DGT..... Discharge gas temperature monitoring
B2..... Oil level watch (TraxOil)	OW..... Digital oil level watch
B3..... Oil differential pressure switch (OPS)	OPS..... Oil differential pressure protection
B11..... High-pressure switch	AR..... Alarm relay
B12..... Low-pressure switch	DS..... Run/control signal
CTR2..... DP Gateway	
E1..... Heater	CH..... Control oil heater
F1,F2,F3 Compressor fuses	PTC..... Motor thermal protection
F4, F5.... Fan fuses	PM..... Phase monitoring
F6..... Module and heater fuse	PS..... Power supply
F7..... Control circuit fuse	
H1..... Diagnosis LED	
K11..... Time relay for part-winding (if used)	
M2..... Fan motor	
Q11..... Compressor contactor	Q15..... Fan contactor
Q12..... Compressor contactor Y (if Y/Δ start)	Q13..... Compressor contactor Δ (if Y/Δ start)
Q14..... Compressor contactor 2 <sup>nd</sup> part-winding (if used)	
SB1..... Reset button	
Y21..... Solenoid valve capacity control 1	
Y22..... Solenoid valve capacity control 2	
T1..... Current sensor	CM..... Current monitoring

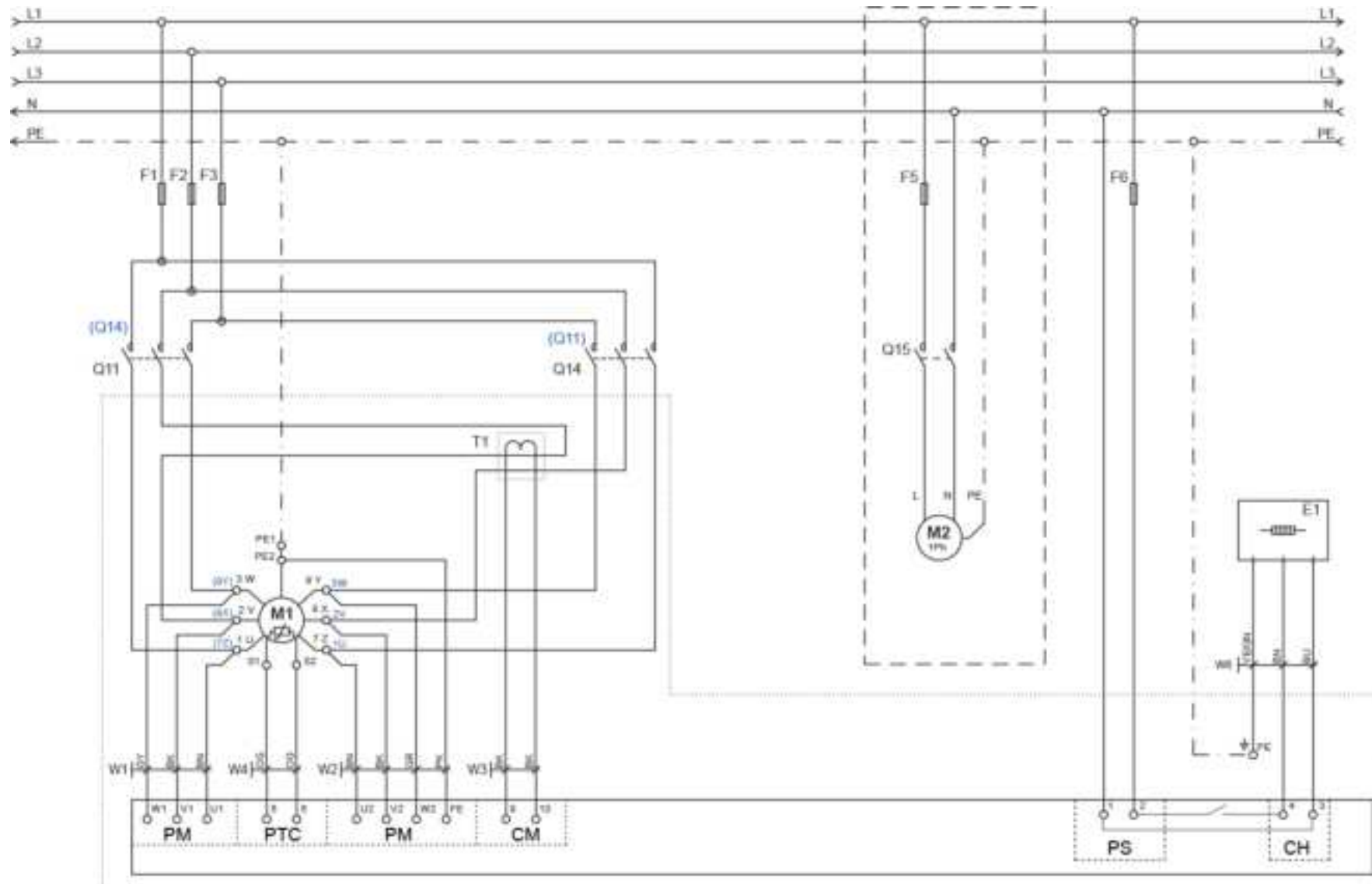
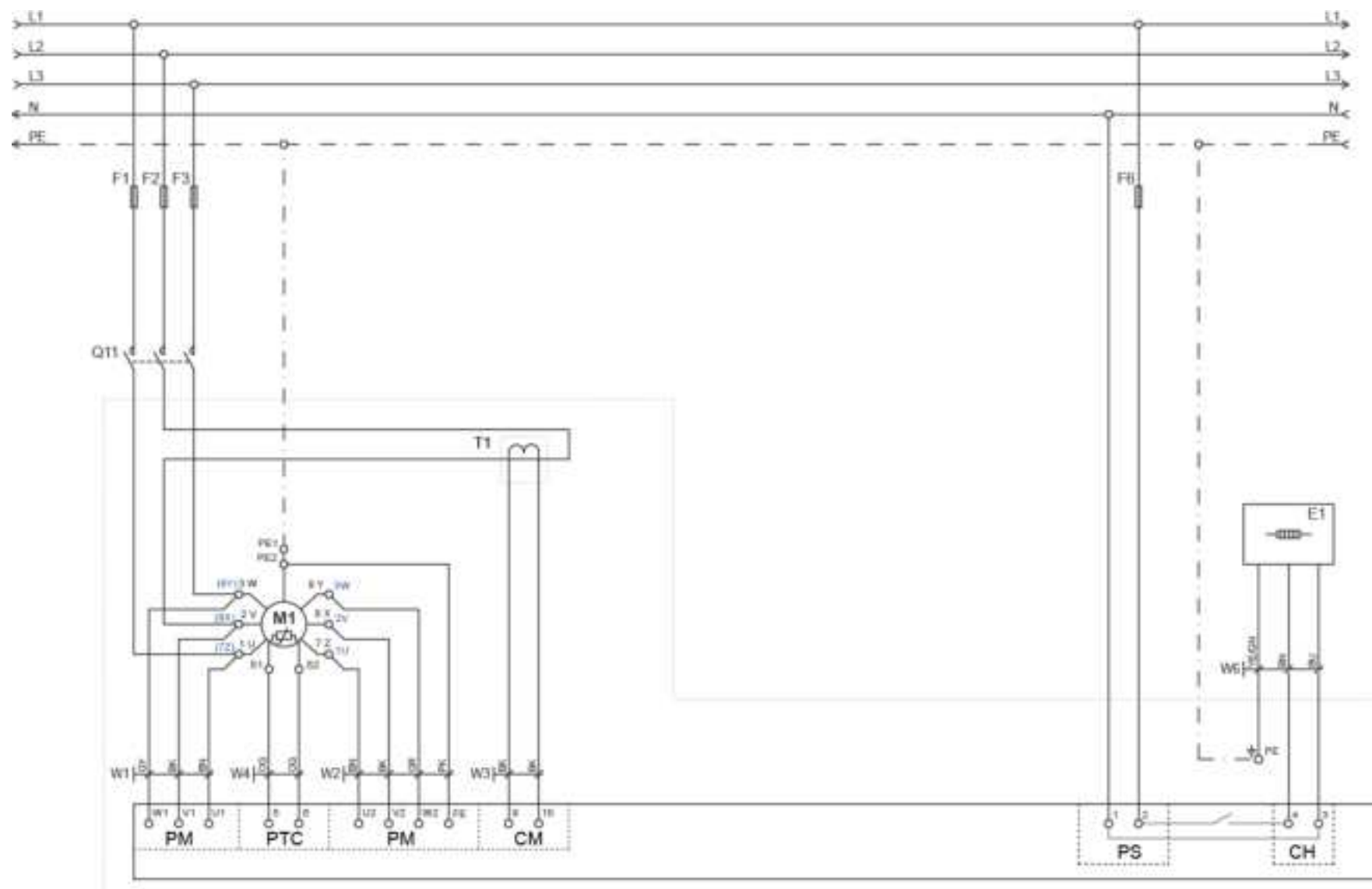


Figure 7: Wiring diagram for AW... motors connected for part-winding start

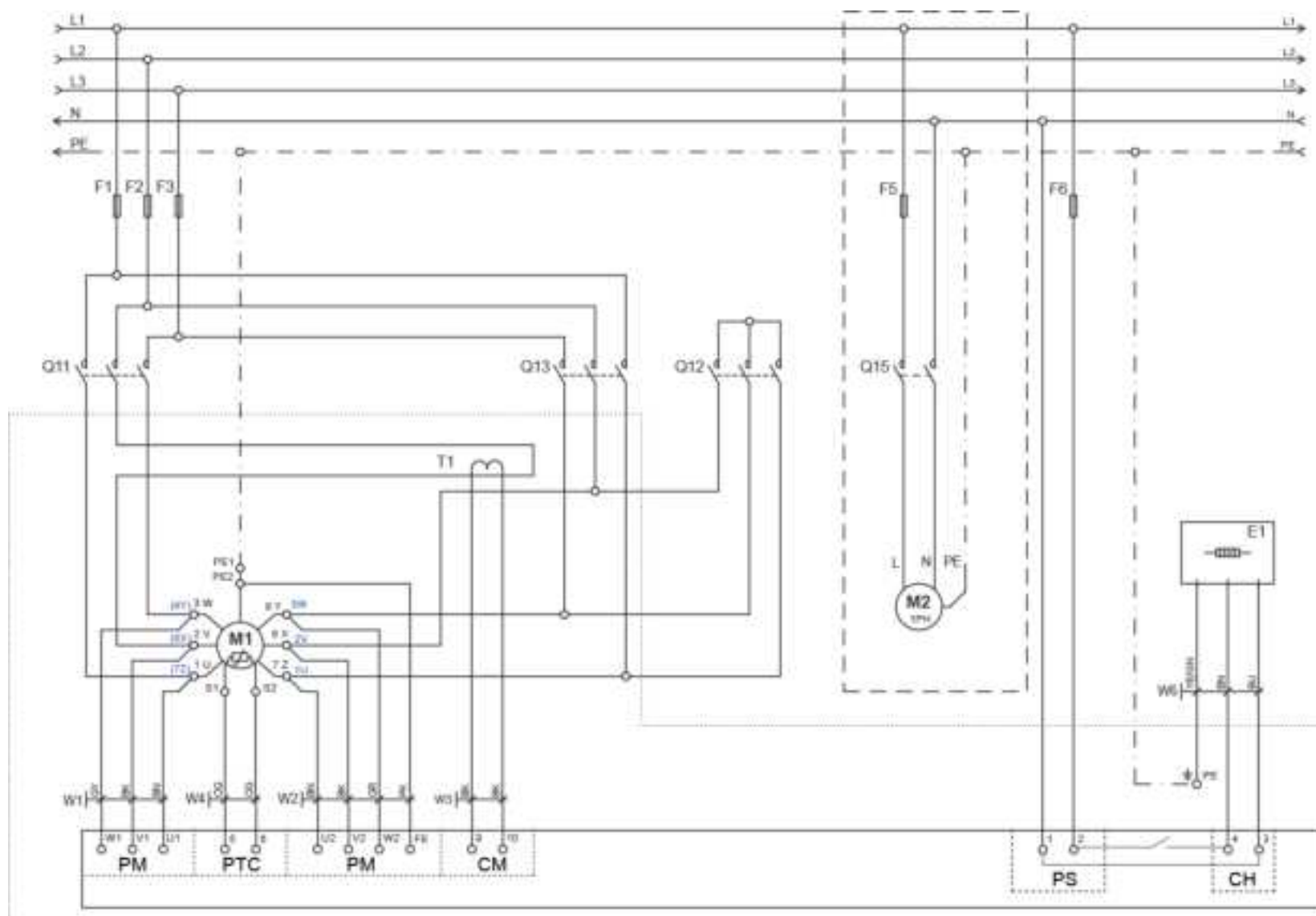
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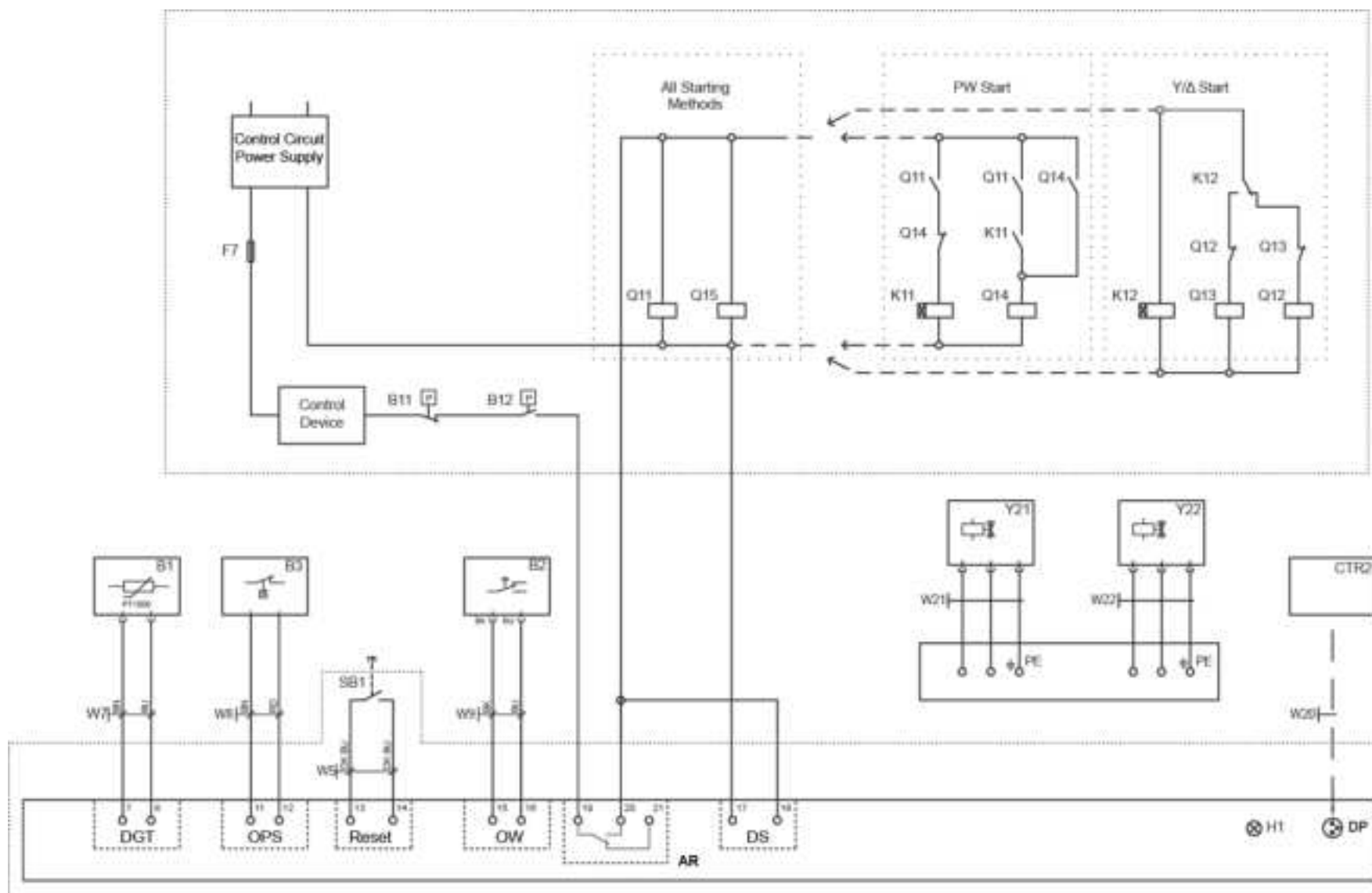
**Figure 8: Wiring diagram for Direct Start with part-winding motors (AW...)**

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**Figure 9: Wiring diagram for Star / Delta motors (EW...)**

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**Figure 10: Wiring diagram, control circuit, protections for part-winding and Star / Delta motors (AW... and EW...)**

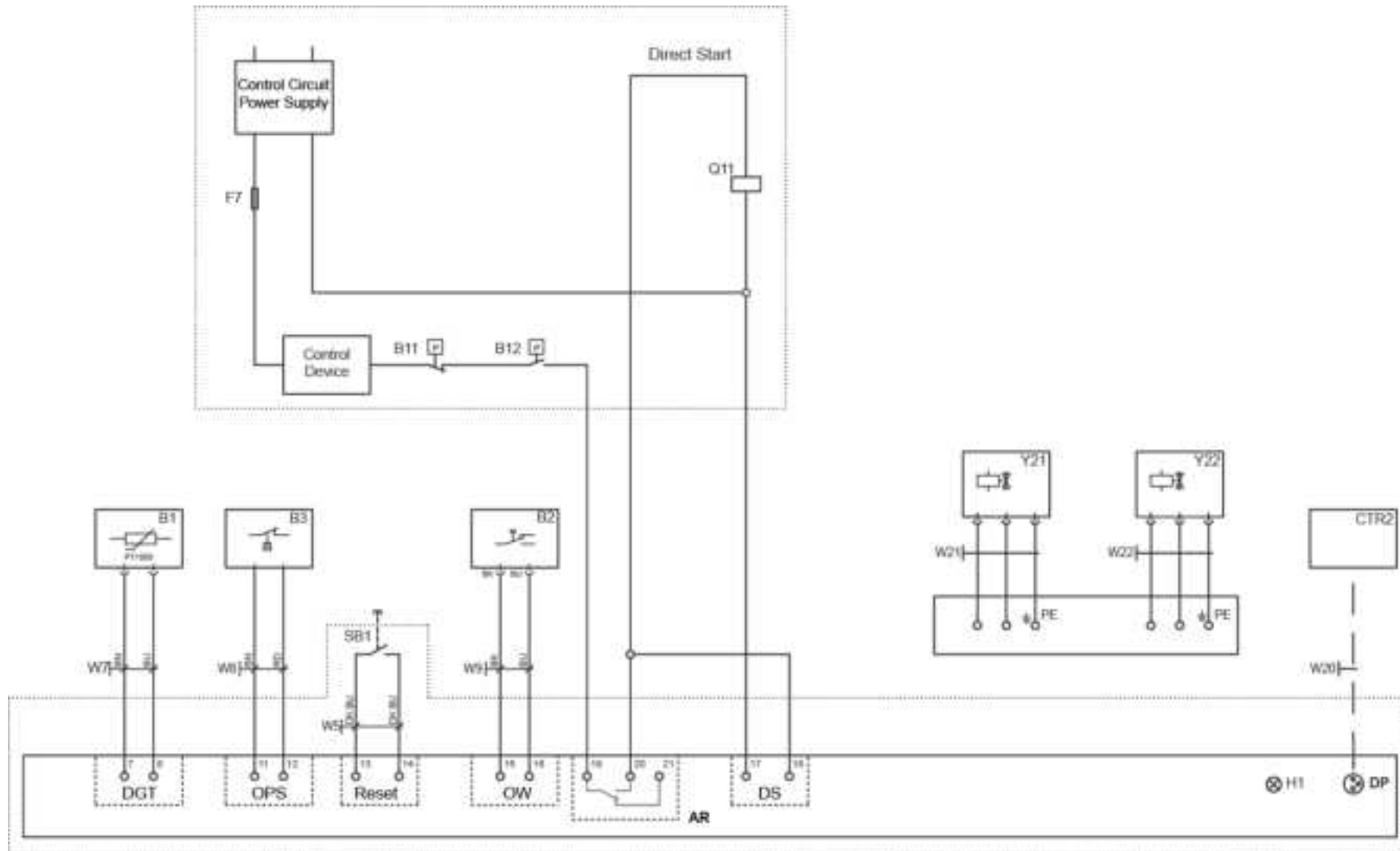


Figure 11: Wiring diagram, control circuit, protections with **Direct Start**

### 3 Terminal box cover

**WARNING**

**Compressor terminal box cover open! Danger of electric shock!** Always ensure that the compressor terminal box cover is properly closed before restarting the unit.

The terminal box must be replaced with the one delivered in the kit to allow viewing the LED indications. The status LEDs in 3 colours (green, orange and red) are visible through the window on the top of the terminal box.



Figure 12: Copeland compressor electronics module terminal box with LED indicators and reset button