Example 6. Closed-loop constant-pressure control

Purpose

This configuration controls a pump automatically using a pressure sensor with a measurement range of 0 to 16 bar and a 4-20 mA output. The control setpoint is entered as a preset digital value in parameter F13.01, expressed as a percentage of the signal at the analog input (AI).

Wiring

This example shows two wiring arrangements.
• Using the built-in power supply (Figure 1).
• Using an external power supply (Figure 2).

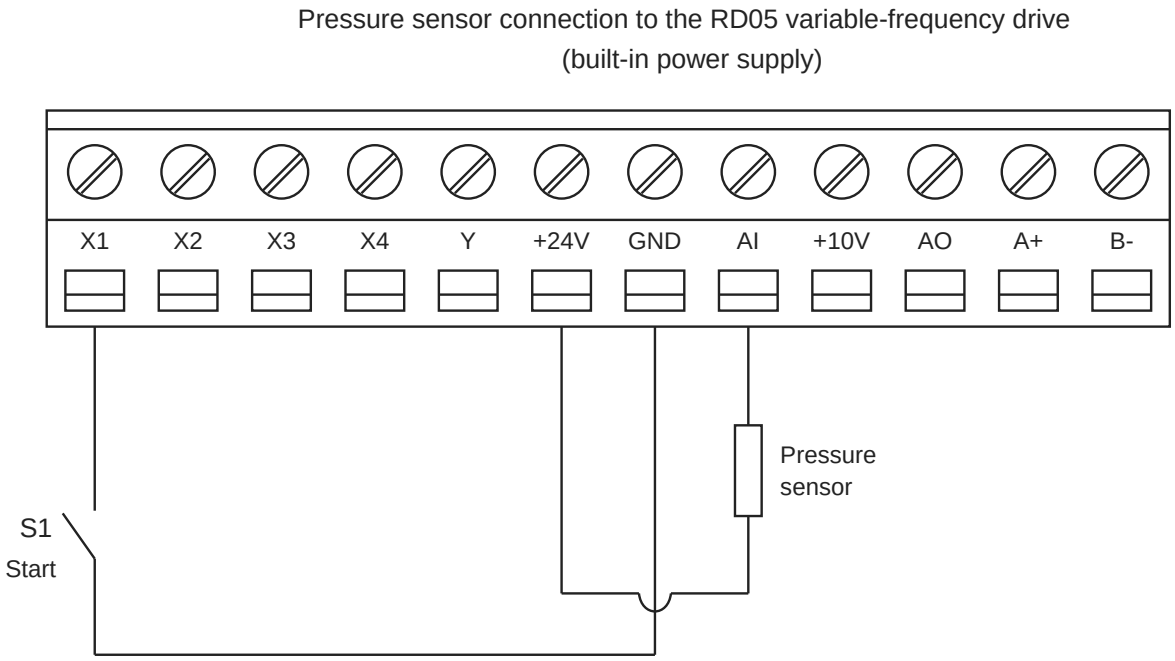


Figure 1. Pressure sensor connection to the variable-frequency drive (RD) using the built-in power supply.

Pressure sensor connection to the RD05 variable-frequency drive
(external power supply)

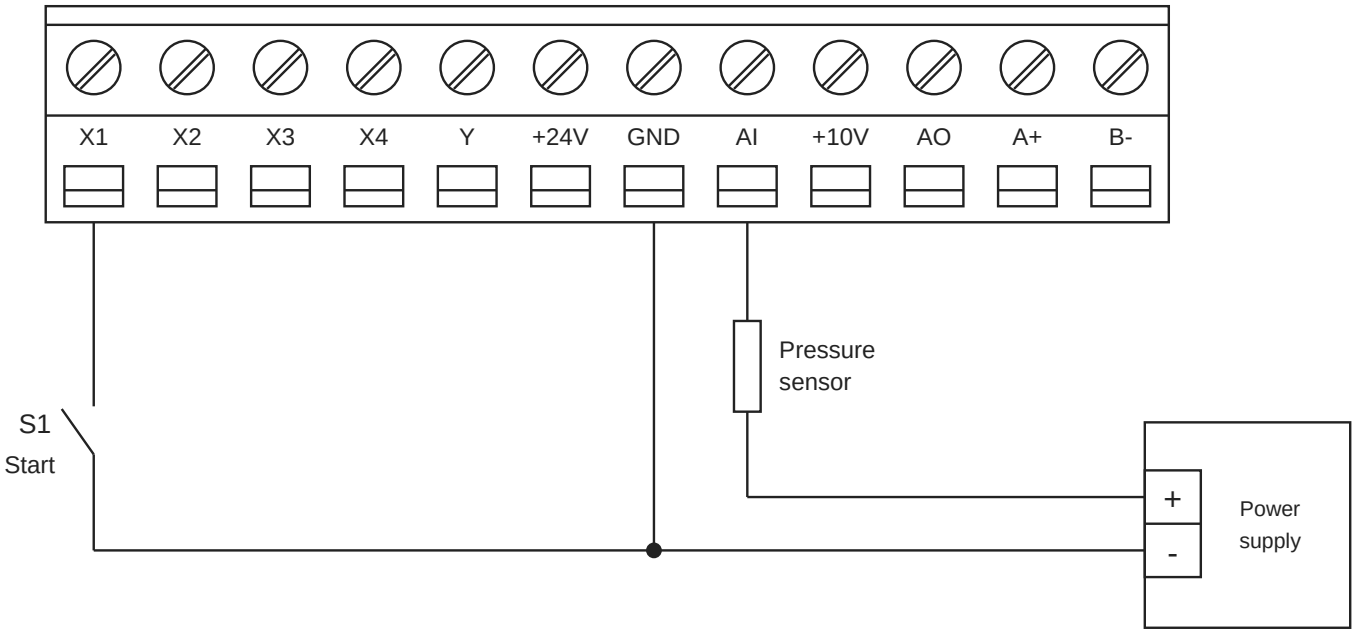


Figure 2. Pressure sensor connection to the RD using an external power supply.

Note. When connecting a pressure sensor with a current output, set the DIP switch for the relevant analog input (AI1 in this example) to the “I” position.

GND is the common terminal on 0.75-5.5 kW models. COM is the common terminal on 7.5-22 kW models.

Control sequence

1. Close the contact between terminals X1 and GND to start the induction motor.

2. In automatic mode, closed-loop process control maintains the specified pressure. This example uses a 50% setpoint, corresponding to a 12 mA signal from the feedback sensor.

3. Open the contact between terminals X1 and GND to stop the motor.

Parameter list

Table 1. Parameter settings.

No.	Code	Description	Value	Notes
1	F01.01	Run command source	1	Start/stop control via digital input
2	F01.02	Frequency reference source	8	Closed-loop process control using the PID controller and feedback
3	F01.10	Maximum output frequency	50	Rated nameplate frequency, Hz
4	F01.13	Lower frequency limit	20	Recommended minimum operating frequency for pumps, Hz
5	F01.22	Acceleration time	5	Protection against water hammer
6	F01.23	Deceleration time	5	Protection against water hammer
7	F02.00	Motor type		Set to match the motor
8	F02.01	Number of motor poles		Set to match the motor
9	F02.02	Rated motor power		Set to match the motor
10	F02.03	Rated motor frequency		Set to match the motor
11	F02.04	Rated motor speed		Set to match the motor
12	F02.05	Rated motor voltage		Set to match the motor
13	F02.06	Rated motor current		Set to match the motor

Parameter list

Table 1. Parameter settings (continued).

No.	Code	Description	Value	Notes
14	F05.00	X1 terminal function	1	Forward run
15	F05.20	Control mode selection	0	Two-wire control, mode 1
16	F05.22	Active state of terminals X1-X4	0000	Active when the contact is closed
17	F5.41	AI1 input signal type	1	0-20 mA current signal
18	F5.50	AI1 analog input lower limit	20	Restricts the current signal range to 4-20 mA
19	F7.00	Starting mode	2	Flying start (speed search)
20	F13.00	PID setpoint source	0	Control panel (parameter F13.01)
21	F13.01	PID setpoint	50	Setpoint expressed as a percentage of the analog input signal
22	F13.03	PID feedback source	2	Pressure sensor feedback
23	F13.07	PID controller configuration	0000	PID controller logic configuration
24	F13.11	Proportional term	1	Tune to reduce overshoot
25	F13.12	Integral time	8	Tune to reduce overshoot
26	F13.12	Derivative term	0.5	Tune to reduce overshoot