Technical Note

VFD Sleep Mode

History

Rev.	Comments	Date
V1.0	First published	15th September 2022

 DELTA

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1 Introduction

In water supply applications, sleep mode provides a way to save energy.

Even if a water pump runs at minimum speed in a water supply system, as long as all taps are closed, the pressure will rise. In that situation with activated sleep mode, the drive will stop the pump. When the pressure drops due to opening of a tap, the pump will start again. This technical note describes three ways to implement sleep mode.

Be aware that this document addresses qualified persons, and it cannot replace profound technical education and training.

2 Sleep Mode by External Frequency Command

This implementation of sleep mode is available in C200, C2000 series and M300 series drives. It only works in V/f motor control mode.

The internal PID control is off. The speed command comes from an external source, e.g. an external PID controller through communication or analog input.

When the frequency command is smaller than or equal to the sleep frequency, the motor will run with the sleep reference frequency. After the sleep delay time, the motor stops.

When the frequency command is greater than or equal to the wake-up frequency, after the wake-up delay time the motor starts.

The wake-up frequency must be set higher than the sleep frequency.

Table 2.1 Parameters for Sleep Mode by External Frequency Command

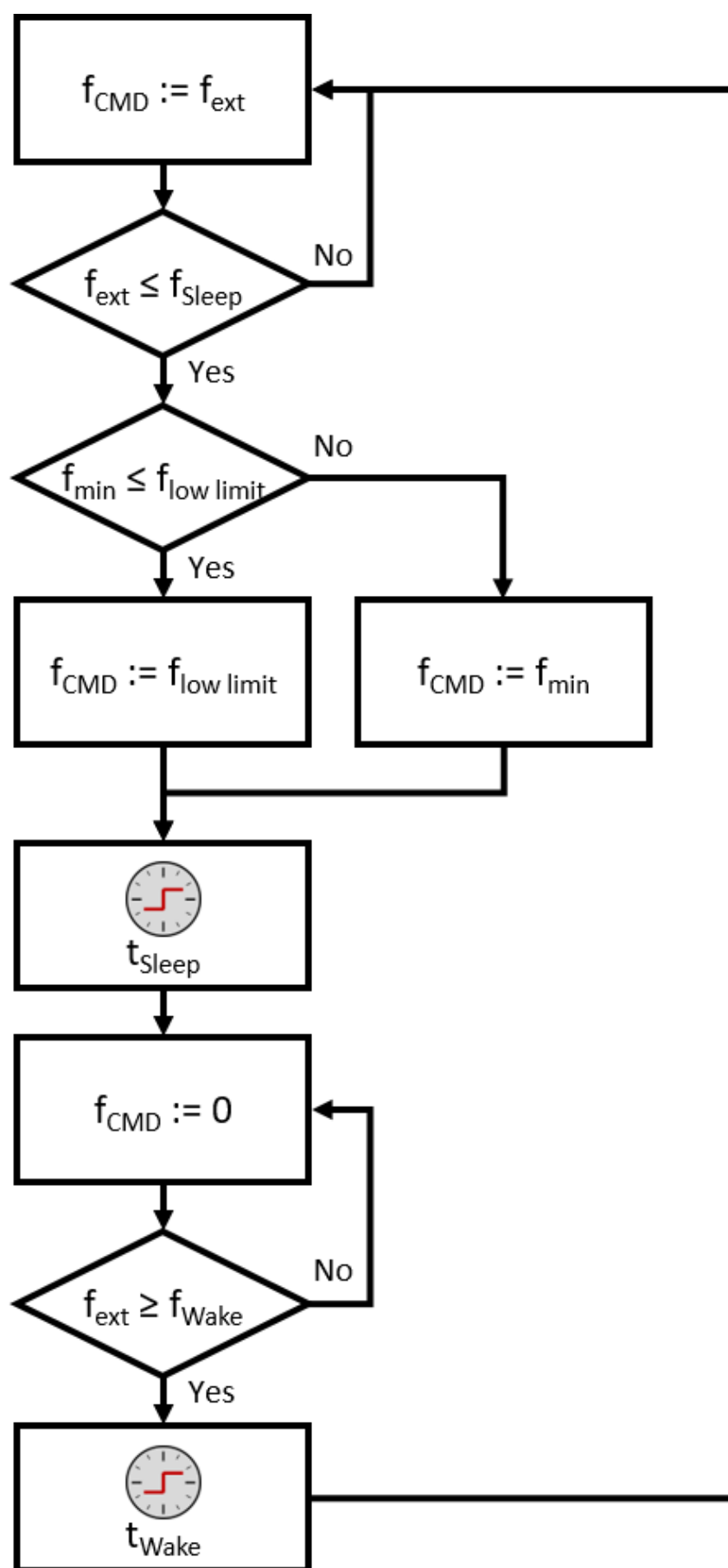| Parameter Description	Parameter Number	Comment
PID Control	08-00 = 0	
Sleep Frequency	08-10	Set 08-11 > 08-10
Wake-Up Frequency	08-11	
Sleep Delay Time	08-12	
Wake-Up Delay Time	08-22	

Figure 2.1 Flow Chart of Sleep Mode by External Frequency Command

3 Sleep Mode by Internal PID Frequency Command

This implementation of sleep mode is available in C200, C2000 series, M300 series and VFD-E series drives.

Internal PID control is on. The internal PID controller calculates the frequency command, which is the relevant control parameter.

When the frequency command is smaller than or equal to the sleep frequency, the motor will run at the higher frequency of the parameters for minimum frequency and lower limit frequency. After the sleep delay time, the motor stops.

When the frequency command is greater than or equal to the wake-up frequency, after the wake-up delay time, the motor starts.

The wake-up frequency must be set higher than the sleep frequency.

Table 3.1 Parameters for Sleep Mode by Internal PID Frequency Command

| Parameter Description	Parameter Setting		Comment
	C200 C2000 series M300 series	VFD-E VFD-EL VFD-EL-W	
PID Control	08-00 ≠ 0	10.00 ≠ 0	
Sleep Frequency	08-10	10.15	Set 08-11 > 08-10 Set 10.16 > 10.15
Wake-Up Frequency	08-11	10.16	
Sleep Delay Time	08-12	10.14	
Wake-Up Delay Time	08-22		
Sleep Mode Function	08-18 = 0	n/a	
Minimum Output Frequency	01-07	01.05	The higher value of the two parameters is the frequency command during sleep delay time
Lower Limit Frequency	01-11	01.08	
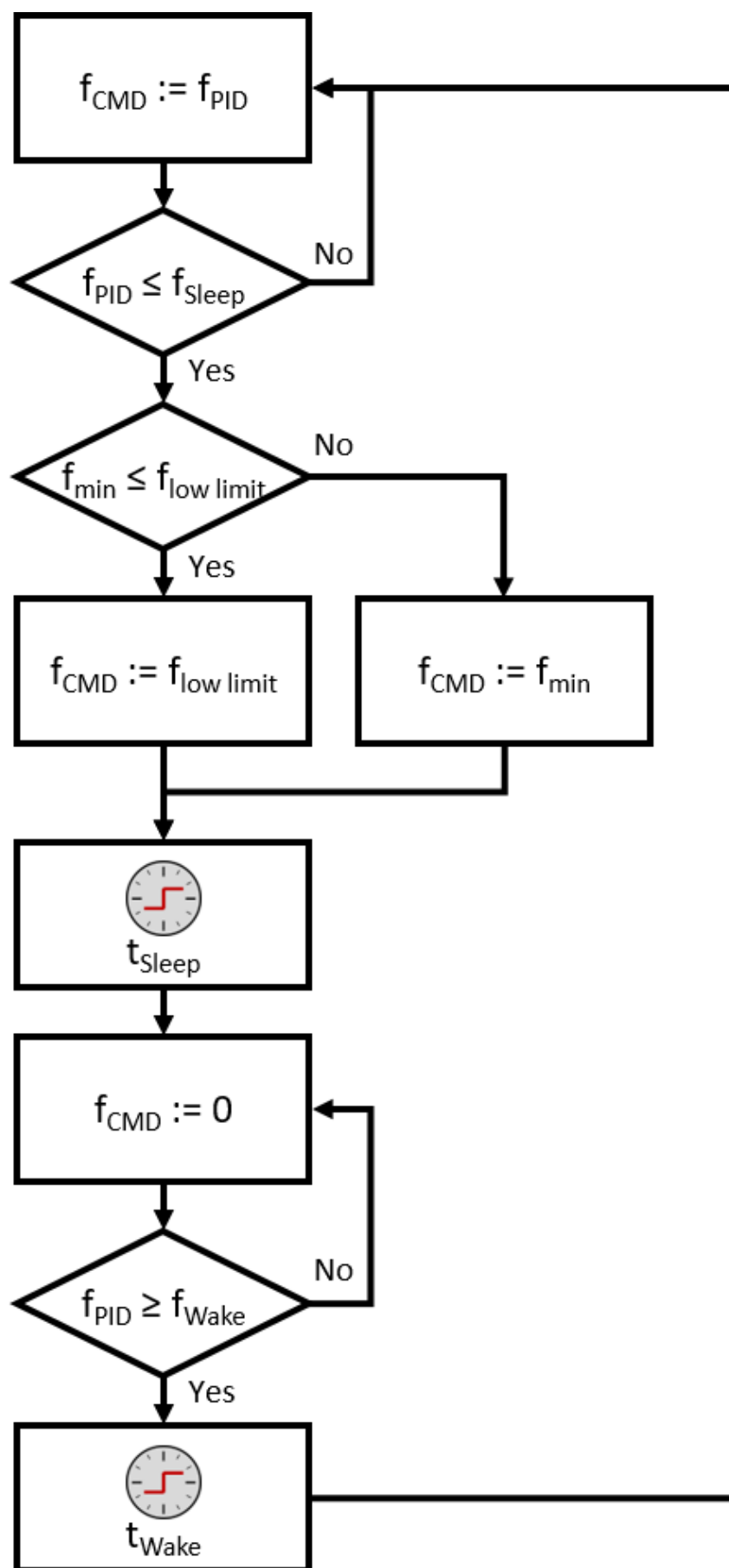
Figure 3.1 Flow Chart of Sleep Mode by External Frequency Command

4 Sleep Mode by Internal PID Feedback Signal

This implementation of sleep mode is available in C200, C2000 series and M300 series drives.

Internal PID control is on. The relevant control parameter is the feedback, e.g. a pressure sensor or a flow sensor.

When the feedback signal is greater than or equal to the sleep frequency, the motor will run at the higher frequency of the parameters for minimum frequency and lower limit frequency. After the sleep delay time, the motor stops.

When the feedback signal is smaller than or equal to the wake-up frequency, after the wake-up delay time, the motor starts.

The sleep frequency must be set higher than the wake-up frequency.

Table 4.1 Parameters for Sleep Mode by Internal PID Feedback Signal

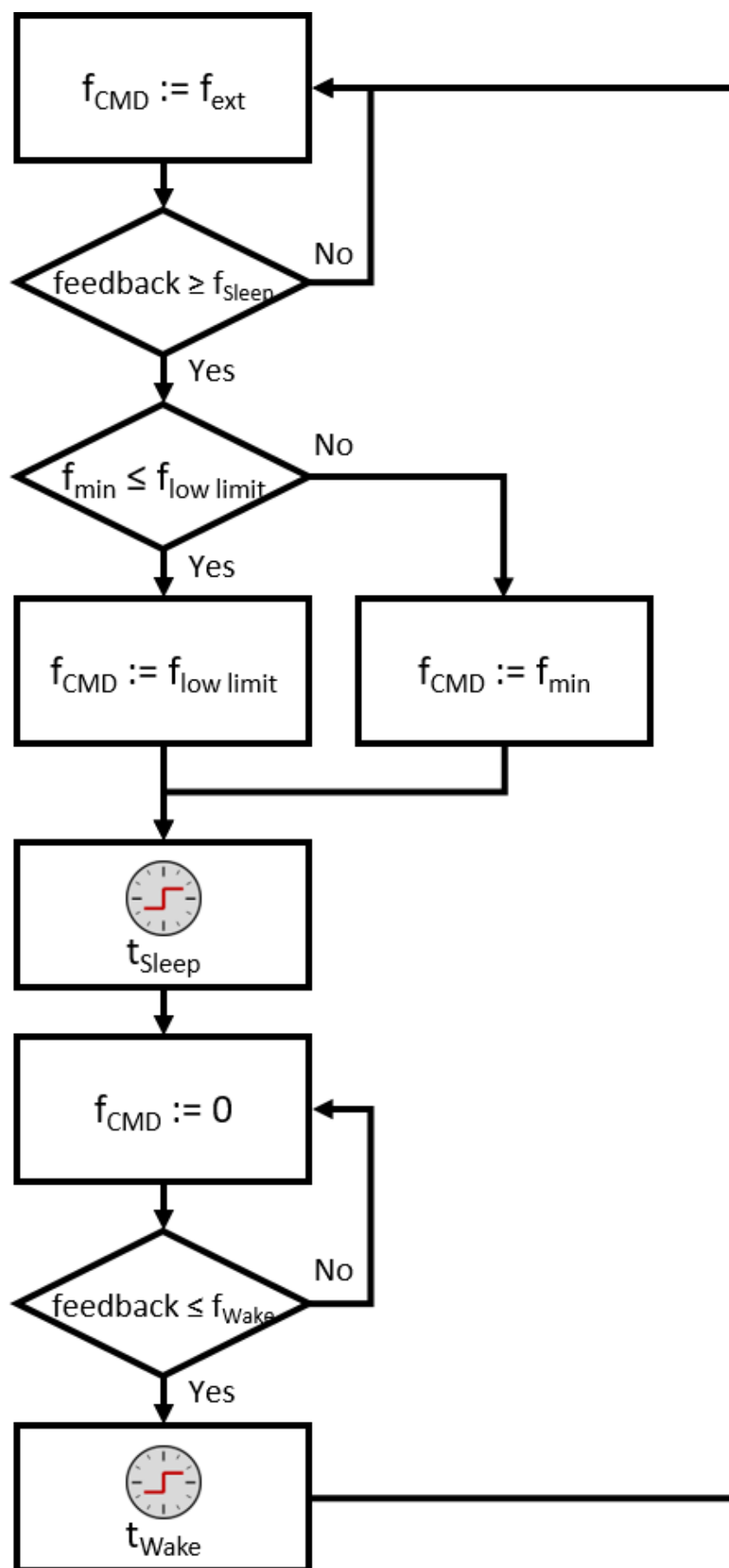| Parameter Description	Parameter Number	Comment
PID Control	08-00 ≠ 0	
Sleep Frequency	08-10	Set 08-10 > 08-11
Wake-Up Frequency	08-11	
Sleep Delay Time	08-12	
Wake-Up Delay Time	08-22	
Sleep Mode Function	08-18 = 1	
Minimum Output Frequency	01-07	The higher value of the two parameters is the frequency command during sleep delay time
Lower Limit Frequency	01-11	

Figure 4.1 Flow Chart of Sleep Mode by External Frequency Command