MotionConvert

CiA 402 Statusword & Controlword: Bit Reference

Objects 0x6041 and 0x6040 · IEC 61800-7-201 / 61800-7-301 · CiA 402-2:2021

Statusword (0x6041, drive → master)

BIT	MASK	NAME	MEANING
0	0x0001	**Ready to Switch On** RTSO	DC bus ready. Set in Ready to Switch On, Switched On, Operation Enabled, Quick Stop Active.
1	0x0002	**Switched On** SO	Power stage on. Set in Switched On, Operation Enabled, Quick Stop Active.
2	0x0004	**Operation Enabled** OE	PWM modulating, motor under control. Set in Operation Enabled and Quick Stop Active only.
3	0x0008	**Fault** F	Drive in Fault or Fault Reaction Active. Read 0x603F for the fault code.
4	0x0010	**Voltage Enabled** VE	High voltage (DC bus) present and OK.
5	0x0020	**Quick Stop** QS	Active-low: 1 = no quick stop, 0 = quick stop commanded. Inverted by spec.
6	0x0040	**Switch On Disabled** SOD	Drive disabled. Set only in Switch On Disabled state.
7	0x0080	**Warning** W	Vendor-defined warning. No state change. Check vendor warning register.
8	0x0100	**Manufacturer Specific** MS	Vendor-defined. Yaskawa: brake. Beckhoff: motion active. Elmo: motor-on.
9	0x0200	**Remote** REM	Fieldbus controlword is being processed. 0 = drive on local/keypad control.
10	0x0400	**Target Reached** TR	Setpoint reached within window. Meaning depends on mode (PP/PV/HM/CS*).
11	0x0800	**Internal Limit Active** ILA	Setpoint clamped by software position, torque, or velocity limit.
12	0x1000	**Operation Mode Specific** OMS1	PP: Setpoint Ack. HM: Homing Attained. IP: IP active. CS*: Drive follows command.
13	0x2000	**Operation Mode Specific** OMS2	PP/CSP: Following Error. PV: Max Slippage. HM: Homing Error.
14	0x4000	**Manufacturer Specific** MS2	Vendor-defined. Commonly: AKD brake, Yaskawa tuning, Beckhoff TxPDO toggle.
15	0x8000	**Manufacturer Specific** MS3	Vendor-defined. Commonly: STO status, warning-latched, homing subphase.

Controlword (0x6040, master → drive)

BIT	MASK	NAME	MEANING
0	0x0001	**Switch On** SO	Part of the core transition pattern (SO+EV+QS+EO).
1	0x0002	**Enable Voltage** EV	Must be 1 to leave Switch On Disabled. 0 = Disable Voltage (coast).
2	0x0004	**Quick Stop** QS	Active-low: 0 commands Quick Stop, 1 means no quick stop.
3	0x0008	**Enable Operation** EO	Must be 1 together with SO+EV+QS to reach Operation Enabled.
4	0x0010	**Operation Mode Specific** OMS1	PP: New Setpoint (rising edge). HM: Start Homing. IP: Enable Interpolation.
5	0x0020	**Operation Mode Specific** OMS2	PP: Change Set Immediately (1 = abort current, 0 = buffer).
6	0x0040	**Operation Mode Specific** OMS3	PP: Absolute / Relative (0 = absolute, 1 = relative target).

BIT	MASK	NAME	MEANING
7	0x0080	**Fault Reset** FR	Edge-triggered 0→1. Clears Fault if cause removed. Do not hold high.
8	0x0100	**Halt** H	Stops motion per 0x605D without leaving Operation Enabled.
9	0x0200	**Operation Mode Specific** OMS4	PP: Change on Setpoint. Other modes: reserved.
10	0x0400	**Reserved** R	Shall be 0 per the CiA 402 profile.
11	0x0800	**Manufacturer Specific** MS1	Vendor-defined. EPOS4: endless movement toggle. Copley: input shaping.
12	0x1000	**Manufacturer Specific** MS2	Vendor-defined.
13	0x2000	**Manufacturer Specific** MS3	Vendor-defined.
14	0x4000	**Manufacturer Specific** MS4	Vendor-defined.
15	0x8000	**Manufacturer Specific** MS5	Vendor-defined.

States: mask, value, and the controlword that gets you there

Identify a state by masking the statusword and comparing: `(statusword & mask) == value`. The typical column is what a real drive usually reports, with bits 9 (Remote) and 4 (Voltage Enabled) set on top of the canonical pattern.

STATE	MASK	VALUE	TYPICAL	CONTROLWORD	NEXT STEP
Not Ready to Switch On	0x004F	0x0000	0x0000	–	Automatic state at power-up. Cannot be entered or exited by command.
Switch On Disabled	0x004F	0x0040	0x0250	0x0000	Send 0x0006 (Shutdown) to move to Ready to Switch On.
Ready to Switch On	0x006F	0x0021	0x0231	0x0006	Send 0x0007 (Switch On) to close the output stage.
Switched On	0x006F	0x0023	0x0233	0x0007	Send 0x000F (Enable Operation) to start motion control.
Operation Enabled	0x006F	0x0027	0x0237	0x000F	Running state. Send motion setpoints. Halt = 0x010F. Disable = 0x0007.
Quick Stop Active	0x006F	0x0007	0x0217	0x0002	Enter from Operation Enabled with CW bit 2 = 0 (typically 0x0002).
Fault Reaction Active	0x004F	0x000F	0x021F	–	Internal transition. Cannot be commanded. Auto-advances to Fault.
Fault	0x004F	0x0008	0x0218	0x0080	Clear with a rising edge on CW bit 7 (send 0x0080, then 0x0000 or 0x0006).

Startup sequence

CONTROLWORD	COMMAND	DRIVE ENDS UP IN
0x0006	**Shutdown**	Ready to Switch On
0x0007	**Switch On**	Switched On: output stage closed, zero-current hold
0x000F	**Enable Operation**	Operation Enabled: motion commands accepted
0x0002	**Quick Stop**	Quick Stop Active
0x0080	**Fault Reset**	Switch On Disabled, on the rising edge of bit 7 only

Bit 5 of both words is **active-low by spec**: controlword bit 2 = 0 commands Quick Stop, and statusword bit 5 = 1 means no quick stop is active. A disconnected master therefore commands a safe stop. Bits 10–15 of the statusword and 4–9 of the controlword are mode-specific; their meaning depends on 0x6060. Manufacturers may deviate; check the drive manual before trusting bits 8, 11 and 14–15.

Generated from the same data that drives the interactive decoder at motionconvert.com/statusword/. Paste a captured value there to decode it bit by bit. MotionConvert 1.3.2.