

# AKD PDMM®

## Fault Card



**Edition December 2018, Revision L**

Valid for Hardware Revision EB

Part Number 903-200015-00



For safe and proper use, follow these instructions.  
Keep them for future reference.

**KOLLMORGEN**®

*Because Motion Matters™*

**Record of Document Revisions:**

Revision	Remarks
A, 04/2012	Launch version.
B, 12/2012	Error E24, E53, and alarm A38 was added, A30 was revised.
C, 09/2013	Added F127, F312, F421, F423, F451 - F469, F493, F560, and F621-F627.
D, 05/2014	Added F630, E53, and A53.
E, 12/2014	Added F465, F470, F570, and F582
F, 05/2015	Hardware revision changed from DB to EB and faults updated to firmware version 1.13.
G, 12/2015	Added F256, and F257. N107, F108, F306, F426, F452, F467, and F536 were revised.
H, 9/2016	E30, A38 were revised
J, 03/2017	Added F120, F124, n179, n180, F471, n495, F631, F706. n107 and n108 updated.
K, 10/2017	Added F314
L, 8/2018	Added F587

**Trademarks**

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**Technical changes which improve the performance of the device may be made without prior notice.**

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## 2 Fault and Warning Messages

When a fault occurs, the drive fault relay is opened, the output stage is switched off (motor loses all torque), or the load is dynamically braked. The specific drive behavior depends on the type of fault. The LED display on the front panel of the drive shows the number of the fault that occurred. If a warning is issued prior to the fault, the warning is shown on the LED and has the same number as the associated fault. Warnings do not trip the power stage of the drive or fault relay output.

The left side of the LED displays F for a fault or n for a warning. The right side displays the fault or warning number as follows: 1-0-1-[break]. The highest priority fault is displayed on the LED. Multiple faults may be present when a fault condition is occurring. Check the WorkBench Fault Screen or read the status of DRV.FAULTS through the controller or HMI for the entire list of faults.

Fault	Message/Warning	Cause	Remedy	Drive Response to Fault
• •		<ol style="list-style-type: none"> <li>24V Control Power input voltage dip.</li> <li>Auxillary encoder 5V (X9-9) shorted.</li> </ol>	<ol style="list-style-type: none"> <li>Insure adequate 24V supply current capacity for the system.</li> <li>Check and fix X9 wiring.</li> <li>Check additional capacity for releasing the motor brake. An increased current consumption is expected which needs to be provided by the power supply.</li> </ol>	N/A
F0		Reserved.	N/A	N/A
F101	Firmware incompatible.	Installed firmware is not compatible with the drive hardware.	Load compatible firmware into the drive.	Disable power stage
n101	The FPGA is a lab FPGA.	The FPGA is a lab version FPGA.	Load the released FPGA version that is compatible with the operational firmware.	None
F102	Resident Firmware failed.	Software failure detected.	Restart drive. If issue persists, contact technical support.	Disable power stage
n102	Operational FPGA is not a default FPGA.	The FPGA minor version is larger than the operational firmware default FPGA minor version	Load the released FPGA version that is compatible with the operational firmware.	None
F103	Resident FPGA failed.	Software failure detected. Load resident FPGA failure occurred (several cases according to flowchart, including incompatible image to FPGA type and fieldbus type).	Restart drive. If issue persists, contact technical support.	Disable power stage

Fault	Message/Warning	Cause	Remedy	Drive Response to Fault
F104	Operational FPGA failed.	Software failure detected. Load operational FPGA failure occurred (several cases according to flowchart).	Restart drive. If issue persists, contact technical support.	Disable power stage
F105	NV Memory Stamp.	Non-volatile memory stamp is corrupted or invalid.	Reset the drive to default memory values using Parameter Load in WorkBench.	Disable power stage
F106	NV Memory Data (might occur when downloading firmware).	Non-volatile memory data is corrupted or invalid. When this fault occurs after a firmware download, it is not an indication of a problem (clear the fault and perform a “save” to the drive).	Reset the drive to default memory values using Parameter Load in WorkBench.	Disable power stage
n107	Positive limit switch triggered.	Either a digital input is configured as positive limit switch ( DINx.MODE18) and its state is “off” OR a positive software position limit is configured (SWLS.EN ) and the actual position PL.FB is greater than the configured limit (see also SWLS.LIMIT0 / SWLS.LIMIT1 ).	Move the load away from the limits.	Controlled stop
n108	Negative limit switch triggered.	Either a digital input is configured as negative limit switch ( DINx.MODE 19) and its state is “off” OR a negative software position limit is configured (SWLS.EN ) and the actual position PL.FB is less than the configured limit (see also SWLS.LIMIT0 / SWLS.LIMIT1 ).	Move the load away from the limits.	Controlled stop
F120	Failed to default parameters.	Drive parameters could not be reset to default because the drive was enabled or, on AKD-C, a connected AKD-N was enabled.	Disable the drive or all connected AKD-N drives and try resetting again.	Disable power stage

Fault	Message/Warning	Cause	Remedy	Drive Response to Fault
F121	Homing Error.	Drive did not finish homing sequence.	Check homing sensor, homing mode, and homing configuration.	Controlled stop
F123 n123	Invalid motion task.	Invalid motion task.	Check motion task settings and parameters to make sure that the values entered will produce a valid motion task.	Disable power stage
F124	Cogging compensation non volatile memory data error (CRC).	The cogging compensation table saved in non-volatile memory is corrupted.	Configure and save your cogging compensation table again. If the fault persists, send the drive for repair.	Disable power stage
F125 n125	Fieldbus Sync frames lost.	The fieldbus lost synchronization.	Check fieldbus connection (X5 and X6 if you are using EtherCAT; X12 and X13 if you are using CANopen) or the settings of your EtherCAT or CANopen master.	Controlled stop
F126 n126	Bode plot too much movement.	Too much movement was created during a Bode plot. Motor is unstable and is not following drive instructions.	Check that the system is closed loop stable. Refer to the system tuning guide.	Dynamic braking
F127	Incomplete Emergency Procedure.	Incomplete emergency stop procedure (problem with the emergency stop motion task).	Disconnect power from drive and check emergency stop procedure.	Dynamic braking
F128	Mpoles / Fpoles not integer.	Ratio of motor poles to feedback poles must be a whole number.	Change to a compatible feedback device.	Disable power stage
F129	Fieldbus Heartbeat lost.	Heartbeat lost.	Check CANopen cabling. Reduce bus load or increase the heartbeat update time.	Controlled stop
F130	Secondary feedback supply over current.	5V power supply was shorted out on X9.	Check X9 connection.	Disable power stage
F131	Secondary feedback A/B line break.	Problem in secondary feedback detected.	Check secondary feedback (X9 connection).	Disable power stage
F132	Secondary feedback Z line break.	Problem in secondary feedback detected.	Check secondary feedback (X9 connection).	Disable power stage
F133	Fault number changed to F138. See F138 for details.			Disable power stage

Fault	Message/Warning	Cause	Remedy	Drive Response to Fault
F134	Secondary feedback illegal state.	Feedback signals were detected in an illegal combination.	Check X9 connection.	Disable power stage
F135 n135	Fault on FB2 is preventing remote commutation for FB1.	Attempt to issue motion task before the axis is homed. Axis must be homed before motion task can start.	Change opmode or home axis.	Disable power stage
F136	Firmware and FPGA versions are not compatible.	The FPGA version does not match the firmware FPGA version constants.	Load the FPGA version that is compatible with the firmware.	Disable power stage
n137	Homing and feedback mismatch	The configured homing mode is not supported by the motor feedback type used.	Change homing mode.	None
F138	Instability during autotune.	Drive current (IL.CMD) or velocity feedback (VL.FB) exceeds allowable limit (BODE.IFLIMIT or BODE.VFLIMIT). This fault only occurs in BODE.MODE 5. This fault often occurs when complex mechanics, belts, and compliant loads are present.	Change BODE.MODE if appropriate. If BODE.MODE 5 is appropriate and the fault occurs at the end of an Autotuning, then the motor is not robustly stable. You can manually adjust Autotuner settings. Manual tuning may be required to make the motor stable.	Controlled stop
F139	Target position was overshoot due to invalid motion task activation.	The drive cannot decelerate from its current speed to reach the end point of the second motion task without moving past it. Increase the deceleration rate in the move or trigger the move earlier.	Change Motion task profile and clear fault with DRV.CLRFAULTS. Or change the value of FAULT139.ACTION = 1 to ignore this condition.	Disable power stage
n140 (deprecated in 1.10.2.000)	VBUS.HALFVOLT has changed. Save the parameters and reboot the drive.	The user has changed the numerical value of VBUS.HALFVOLT. This change only takes effect after a DRV.NVSAVE command and after rebooting the AKD.	Save the parameters in the non-volatile memory via a DRV.NVSAVE command and turn off/on the 24[V] power supply in order to reboot the drive or restore the original setting of VBUS.HALFVOLT.	None

Fault	Message/Warning	Cause	Remedy	Drive Response to Fault
n151	Not enough distance to move; motion exception.	<p>For trapezoidal and customer table motion tasks: The target velocity specified in the motion task cannot be reached via using the selected acceleration and deceleration since the distance to travel is not sufficient.</p> <p>For a 1:1 profile: The selected acceleration and deceleration will be extended since there is too much distance to travel and the motion task would exceed its maximum allowed velocity.</p>	Activation of any new motion or using of DRV.CLRFAULTS will clear the warning. Check motion task settings and parameters to make sure that the values entered will produce a valid motion task.	None
n152	Not enough distance to move; following motion exception.	A new motion task activated, when one motion task is already active and the target position specified in the motion task parameters cannot be reached with specified target velocity, acceleration and deceleration parameters. The motion task will directly decelerate to into the target position or ramps down to velocity 0 and start another move to reach target position of the next motion task.	Activation of any new motion or using of DRV.CLRFAULTS will clear the warning. Check motion task settings and parameters to make sure that the values entered will produce a valid motion task.	None
n153	Velocity limit violation, exceeding max limit.	A new target velocity calculated internally due to an exception, and is being limited due to user velocity limit.	Activation of any new motion or using of DRV.CLRFAULTS will clear the warning. Check motion task target velocity settings and parameters to make sure that the values entered will not exceed the VL.LIMITP and VL.LIMITN setting.	None



Fault	Message/Warning	Cause	Remedy	Drive Response to Fault
n154	Following motion failed; check motion parameters.	Activation of the following motion task failed due to incompatible parameters, or motion task does not exist.	Activation of any new motion or using of DRV.CLRFAULTS will clear the warning. Check following motion task settings and parameters to make sure that the values entered will produce a valid motion task.	None
n156	Target position crossed due to stop command.	The motion task crosses the target position after triggering a DRV.STOP command. This situation can happen when processing a change-on-the-fly motion task and triggering a DRV.STOP command close to the target position of the currently running motion task.	Activation of any new motion or using of DRV.CLRFAULTS will clear the warning.	None
n157	Homing index pulse not found.	A homing mode with index detection is activated, and index pulse is not detected while moving across the range determined by the hardware limit switches.	Activation of any new motion or using of DRV.CLRFAULTS will clear the warning.	None
n158	Homing reference switch not found.	A homing mode with reference switch detection is activated and the reference switch is not detected while moving across the range determined by the hardware limit switches.	Activation of any new motion or using of DRV.CLRFAULTS will clear the warning.	None
n159	Failed to set motion task parameters	Invalid motion task parameters assignment. This warning can appear upon an MT.SET command.	Activation of any new motion or using of DRV.CLRFAULTS will clear the warning. Check motion task settings and parameters.	None
n160	Motion task activation failed.	Activation of the motion task failed due to incompatible parameters, or motion task does not exist. This warning can appear upon an MT.MOVE command.	Activation of any new motion or using of DRV.CLRFAULTS will clear the warning. Check motion task settings and parameters to make sure that the values entered will produce a valid motion task.	None

Fault	Message/Warning	Cause	Remedy	Drive Response to Fault
n161	Homing procedure failed.	Homing error observed during the operation of homing procedure.	Activation of any new motion or using of DRV.CLRFAULTS will clear the warning.	None
n163	MT.NUM exceeds limit.	This warning appears with n160. This warning is triggered when you try to trigger a motion task > 128 (such as MT.MOVE 130).	Trigger only motion tasks between 0 and 128. Activation of any new motion or using of DRV.CLRFAULTS will clear the warning.	None
n164	Motion task is not initialized.	This warning appears with n160. This warning is triggered when you try to trigger a non-initialized motion task.	Initialize the motion task first before starting the task. Activation of any new motion or using of DRV.CLRFAULTS will clear the warning.	None
n165	Motion task target position is out.	This warning appears with n160. This warning is triggered when you try to trigger a motion task with an absolute target position outside of the selected modulo range (see also MT.CNTL).	Move the absolute target position of the motion task within the modulo range. Activation of any new motion or using of DRV.CLRFAULTS will clear the warning.	None
n168	Invalid bit combination in the motion task control word.	This warning appears with n160. This warning is triggered when you try to trigger a motion task with an invalid bit combination in the motion task control word (see also MT.CNTL).	Correct the MT.CNTL setting for the specific motion task. Activation of any new motion or using of DRV.CLRFAULTS will clear the warning.	None
n169	1:1 profile cannot be triggered on the fly.	This warning appears with n160. This warning is triggered when you try to trigger a 1:1 profile table motion task while another motion task is currently running.	1:1 profile table motion tasks should be started from velocity 0. Activation of any new motion or using of DRV.CLRFAULTS will clear the warning.	None
n170	Customer profile table is not initialized.	This warning appears with n160. This warning is triggered when you try to trigger a motion task that uses a customer profile table for generating the velocity profile and when the selected profile table is empty (see MT.CNTL and MT.TNUM).	Change the MT.TNUM parameter for this specific motion task in order to use an initialized profile table. Activation of any new motion or using of DRV.CLRFAULTS will clear the warning.	None

Fault	Message/Warning	Cause	Remedy	Drive Response to Fault
n179	Teaching of Cogging compensation stopped before finishing.	The cogging compensation teach move could not be completed. Some common causes are limit switches, mechanical blockage or the drive being disabled due to a fault.	Make sure your motor is able to move the distance required by the cogging compensation teach move and start the move again.	N/A
n180	Cogging compensation not active. Axis needs to be homed first.	Using a non-absolute feedback a homing procedure is needed before cogging compensation can be applied.	Execute a homing procedure or deactivate cogging compensation.	N/A
F201	Internal RAM failed.	Hardware failure detected.	Restart drive. If issue persists, contact technical support.	Disable power stage
F202	External RAM failed.	Hardware failure detected.	Restart drive. If issue persists, contact technical support.	Disable power stage
F203	Code Integrity failed.	Software failure detected. FPGA register access failure occurred.	Restart drive. If issue persists, contact technical support.	Disable power stage
F204 - F232	EEPROM failure detected	EEPROM failure detected	Restart drive. If issue persists, exchange drive.	Disable power stage
F234 - F237 n234 - n237	Temperature sensor high.	High temperature limit reached.	Check cabinet ventilation system.	Disable power stage
F240 - F243 n240 - n243	Temperature sensor low.	Low temperature limit reached.	Check cabinet ventilation system.	Disable power stage
F245	External Fault.	This fault is user generated and is caused by user settings.	Users can configure a digital input to trigger this fault (DINx.MODE = 10). The fault occurs according to this input setting. Clear the input to clear the fault.	Disable power stage
F247	Vbus read is out of thresholds.	Hardware problem in bus measurement.	Troubleshoot and repair hardware problem.	Disable power stage
F248	Option board EEPROM corrupted.	EEPROM failure detected.	Restart drive. If issue persists, exchange drive.	Disable power stage
F249	Option board downstream checksum.	Communications with the I/O on the option board failed.	DRV.CLRFAULTS. If issue persists If issue persists, contact technical support.	Disable power stage

Fault	Message/Warning	Cause	Remedy	Drive Response to Fault
F250	Option board upstream checksum.	Communications with the I/O on the option board failed.	DRV.CLRFAULTS. If issue persists If issue persists, contact technical support.	Disable power stage
F251	Option board watchdog.	Communications with the I/O on the option board failed.	DRV.CLRFAULTS. If issue persists If issue persists, contact technical support.	Disable power stage
F252	Firmware and option board FPGA types are not compatible.	The option board FPGA is not compatible with this hardware.	Download the correct firmware file for this drive.	Disable power stage
F253	Firmware and option board FPGA versions are not compatible.	The version of the option board FPGA is not compatible with this firmware.	Download the correct firmware file for this drive.	Disable power stage
F256	Analog Input over voltage	The analog input value is above the AIN.OVFTHRESH level.	Check the analog input signal or change the AIN.OVFTHRESH value.	Controlled stop
F257	Analog Input under voltage	The analog input value is below the AIN.UVFTHRESH level.	Check the analog input signal or change the AIN.UVFTHRESH value.	Controlled stop
n256	Warning: Analog Input over voltage	The analog input value is above the AIN.OVWTHRESH level.	Check the analog input signal or change the AIN.OVWTHRESH value.	None
n257	Warning: Analog Input under voltage	The analog input value is below the AIN.UVWTHRESH level.	Check the analog input signal or change the AIN.UVWTHRESH value.	None
F301 n301	Motor overheated.	Motor overheated.	Check ambient temperature. Check motor mounting heat sink capability	Disable power stage
F302	Over speed.	Motor exceeded VL.THRESH value.	Increase VL.THRESH or lower velocity command.	Dynamic braking
F303	Run away.	Motor did not follow command values.	Current command to the motor is too high for too long. Reduce servo gains, or reduce command trajectory aggressiveness.	Controlled stop
F304 n304	Motor Foldback.	Maximum motor power has been exceeded; the power has been limited to protect the motor	Motion is requiring too much power. Change move profile to reduce load on motor. Check for load jamming or sticking. Check that current limits are set correctly.	Controlled stop

Fault	Message/Warning	Cause	Remedy	Drive Response to Fault
F305	Brake open circuit.	Motor brake open circuit. Fault threshold is 200 mA.	Check cabling and general functionality. For special low current brake applications, the F305 fault can be bypassed using the setting motor.brake = 100.	Dynamic braking
F306	Brake short circuit.	Motor brake short circuit.	Check cabling and general functionality. Check that <a href="#">MOTOR.TBRAKERLS</a> and <a href="#">MOTOR.TBRAKEAPP</a> are configured.	Dynamic braking
F307	Brake applied during Enable-State.	Motor brake closed unexpectedly.	Check cabling and general functionality.	Dynamic braking
F308	Voltage exceeds motors rating.	Drive bus voltage exceeds the motor's defined voltage rating.	Make sure that the motor fits the driving rating.	Disable power stage
n309	Motor I2t load. reduce load	Motor I2t load (IL.MI2T) has exceeded the warning threshold IL.MI2TWTRESH. This warning can only be generated in the case that the motor protection mode IL.MIMODE has been set to 1.	Reduce the load of the drive by adjusting lower acceleration / deceleration ramps.	None
F312	Brake released when it should be applied.	Brake disengaged unexpectedly.	Check cabling and general functionality.	Controlled stop
F314	Motor phase loss detected.	One or multiple motor lines are not properly connected.	Check the motor connector/wiring on the AKD.	Disable power stage
F401	Failed to set feedback type.	Feedback is not connected or wrong feedback type selected	Check primary feedback (X10 connection).	Dynamic braking
F402	Analog signal amplitude fault.	Analog signal amplitude is too low or too high. Applicable to all feedback types with sin/cos lines (including Resolver, Endat 2.1, pure Sin/Cos ect.).	Check primary feedback (X10 connection), resolver and sine/cos encoder only.	Dynamic braking
F403	EnDat communication fault.	General communication problem with feedback.	Check primary feedback (X10 connection), EnDat only. If feedback is linear, check calibration.	Dynamic braking

Fault	Message/Warning	Cause	Remedy	Drive Response to Fault
F404	Illegal Hall state (111, 000).	Hall sensor returns invalid Hall state (111, 000); either all Hall sensors are on or off. Legal Hall states are 001, 011, 010, 110, 100, and 101. This fault can be caused by a broken connection in any one of the Hall signals.	Check the feedback wiring; check all feedback connectors to ensure all pins are positioned correctly.	Dynamic braking
F405	BiSS watchdog fault.	Bad communication with the feedback device.	Check primary feedback (X10 connection), Biss only.	Dynamic braking
F406	BiSS multi cycle fault.			
F407	BiSS sensor fault.			
F408 - F416	SFD feedback fault.	Bad communication with the SFD device.	Check primary feedback (X10 connection). If fault persists, internal feedback failure. Return to manufacturer for repair.	Dynamic braking
F417	Broken wire in primary feedback.	In primary feedback, a broken wire was detected (incremental encoder signal amplitude).	Check feedback cable continuity.	Dynamic braking
F418	Primary feedback power supply.	Power supply fault for primary feedback.	Check primary feedback (X10 connection).	Dynamic braking
F419	Encoder init procedure failed.	Phase find procedure did not complete successfully.	Check encoder wiring, reduce/balance motor load prior to phase finding.	Disable power stage
F420	FB3 Endat communication fault.	A communication error was detected with the EnDat 2.2 device connected to the X9 connector.	Check pinout and FB3 configuration and reconnect feedback. If problems persist, contact customer support.	Dynamic braking
F421	SFD resolver sensor fault.	Sensor or sensor wiring failure inside motor.	Try resetting the fault. If it reappears return motor for repair.	Dynamic braking
F423	NV Failure – Extended Multiturn.	The position saved in memory is corrupted.	Home axis or disable extended multiturn. If the fault persists, send the drive for repair.	Disable power stage
F438 n438	Deviation from predicted trajectory fault.	Motor did not follow command values. Motor exceeded maximum allowed position following error (numeric).	Check for increased load, jamming or sticking. Is position error set too low?	Controlled stop

Fault	Message/Warning	Cause	Remedy	Drive Response to Fault			
F439 n439	Following error magnitude fault.	Motor did not follow command values. Motor exceeded maximum allowed position following error (user).	Check feedback commutation setup and tuning parameters.	Controlled stop			
F450	Following error presentation.	Motor did not follow command values. Motor exceeded maximum allowed position following error (presentation).	Check feedback commutation setup and tuning parameters.	Controlled stop			
F451 n451	Feedback battery fault.	The external battery voltage is too low. The F451 fault is generated if the AKD is not powered. The n451 warning is generated if the AKD is powered. This fault can be inhibited with FAULT451.ACTION.	Check or replace the external battery.	Dynamic braking			
F452	Extended Multiturn not supported with this feedback.	Non-multiturn feedback is connected while FB1.PMTSAVEEN is active.	Connect multiturn feedback to the drive or disable extended multiturn.	Disable power stage			
F453	Tamagawa communication fault (timeout).	Bad communication with the feedback device. Cabling or shielding fault, or internal feedback failure.	Check the cabling to the drive and if the problem persists then return the feedback to the manufacturer for repair.	Dynamic braking			
F454	Tamagawa communication fault (transfer incomplete).						
F456	Tamagawa communication fault (CRC).						
F457	Tamagawa communication fault (start timeout).						
F458	Tamagawa communication fault (UART Overrun).						
F459	Tamagawa communication fault (UART Framing).						
F460	Tamagawa encoder fault (over speed).				This fault is generated when the shaft is rotated above a maximum speed that can be maintained while the external battery is powered and the drive is powered off.	Reset the fault on the drive with DRV.CLRFAULTS.	Dynamic braking

Fault	Message/Warning	Cause	Remedy	Drive Response to Fault
F461	Tamagawa encoder fault (counting Error).	When the feedback is powered on the position (within one revolution) was incorrect because of a problem with the feedback device.	Reset the fault on the drive with DRV.CLRFAULTS, if the problem persists then clean the feedback code plate.	Dynamic braking
F462	Tamagawa encoder fault (counting overflow).	Multi-turn counter has overflowed.	Reset the fault on the drive with DRV.CLRFAULTS.	Dynamic braking
F463	Feedback overheat fault.	The temperature of the encoder substrate exceeds overheating detection temperature during main power-on.	Reset the fault on the drive with DRV.CLRFAULTS after temperature of encoder is lowered.	Dynamic braking
F464	Tamagawa encoder fault (multi-turn error).	Any bit-jump occurs in the multi-turn signal during main power-on.	Return to the origin. Reset the fault on the drive with DRV.CLRFAULTS.	Dynamic braking
F465	Excessive shock detected by feedback device.	1. Excessive shock from an impact or vibration has caused an error in the feedback device. or 2. Internal error in the feedback device mechanism, resulted in bad position data.	1. Reduce external impacts to the motor housing and shaft. Tune the control loops filters. Reduce gains, particularly feed forward gains. Reduce maximum commanded acceleration. or 2. Replace the feedback device.	Dynamic braking
F467	Feedback fault on feedback 1 (See FB1.FAULTS for details).	The feedback device malfunctioned.	Check FB1.FAULTS for detailed fault information. If using a BiSS feedback device, fault 467 indicates a communications fault with the BiSS feedback device. No additional information is available via FB1.FAULTS for this fault when using a BiSS feedback device.	Dynamic braking
F469	FB1.ENCRE is not power of two, Remote Commutation not possible.	Feedback Type 43 requires that the feedback resolution be a power of two. Feedback Type 43 is not supported for all feedback resolutions.	If the remote feedback device's resolution is a power of two, enter that value in FB1.ENCRE. Otherwise, choose a feedback device with a supported resolution (power of two) and enter that value in FB1.ENCRE.	Dynamic braking
F470	Feedback fault on feedback 3.	Feedback is not connected or general communication problem.	Check tertiary feedback (X9 connection)	Dynamic braking



Fault	Message/Warning	Cause	Remedy	Drive Response to Fault
F471	Operation in Position Mode with Halls Only feedback not allowed.	Operation in Position Mode with Halls Only feedback not allowed.	Set your drive's mode of operation to velocity or torque when using a Halls Only feedback.	Dynamic braking
F473	Wake and Shake - Insufficient movement	There was less movement than defined by WS.DISTMIN.	Increase WS.IMAX and/or WS.T. Or try using WS.MODE 1 or 2.	Disable power stage
F475	Wake and Shake - Excess movement	WS.DISTMAX has been exceeded in WS.MODE 0. Or more than 360 degrees was traveled in WS.MODE 2.	Increase WS.DISTMAX value or reduce WS.IMAX or WS.T. Wake and Shake is not supported for vertical/overhung loads.	Disable power stage
F476	Wake and Shake - Fine-Coarse delta too large.	The angle difference between the coarse and fine calculation was larger than 72 deg.	Modify WS.IMAX or WS.T and try again.	Disable power stage
F478 n478	Wake and Shake - Over speed	WS.VTHRESH was exceeded.	Increase WS.VTHRESH value or reduce WS.IMAX or WS.T.	Disable power stage
F479 n479	Wake and Shake - Loop angle delta too large.	The angle between complete loops was larger than 72 deg.	Modify WS.IMAX or WS.T and try again.	Disable power stage
F480	Field bus command velocity too high.	Fieldbus command velocity exceeds VL.LIMITP.	Lower fieldbus command trajectory, or increase the value of VL.LIMITP.	Disable power stage
F481	Field bus command velocity too low.	Fieldbus command velocity exceeds VL.LIMITN.	Increase fieldbus command trajectory, or decrease the value of VL.LIMITN.	Disable power stage
F482	Wake and Shake - Commutation not initialized.	The motor requires the commutation initialization (there are no encoder commutation tracks, Hall sensors, etc.) and no successful Wake and Shake sequence has been performed	Clear any faults, activate the Wake and Shake procedure (WS.ARM) and enable the drive.	Disable power stage
F483	Wake and Shake - Motor U phase missing.	No current was detected in the motor's U phase during Wake and Shake initialization (Mode 0 only).	Check the motor connections and WS.IMAX (very low current may produce this error).	Disable power stage
F484	Wake and Shake - Motor V phase missing.	No current was detected in the motor's V phase during Wake and Shake initialization (Mode 0 only).	Check the motor connections and WS.IMAX (very low current may produce this error).	Disable power stage

Fault	Message/Warning	Cause	Remedy	Drive Response to Fault
F485	Wake and Shake - Motor W phase missing.	No current was detected in the motor's W phase during Wake and Shake initialization (Mode 0 only).	Check the motor connections and WS.IMAX (very low current may produce this error).	Disable power stage
F486	Input change rate exceeds maximum speed of emulated encoder.	Motor velocity exceeds the maximum speed the emulated encoder output can generate.	Reduce value of DRV.EMUEPULSEWIDT H.	Controlled stop
F487	Wake and Shake - Validating Positive Movement Failed.	After applying a positive current, motor moved in the wrong direction.	Check motor phase wiring and motor encoder wiring is correct.	Disable power stage
F489	Wake and Shake - Validating Negative Movement Failed.	After applying a negative current, motor moved in the wrong direction.	Check motor phase wiring and motor encoder wiring is correct.	Disable power stage
F490	Wake and Shake - Validating Comm. angle timed out.	During one of the W&S validation stages, the drive stopped responding to commands.	Contact customer support.	Disable power stage
F491	Wake and Shake - Validating Comm. angle moved too far - Bad Comm Angle.	After applying a current, the motor moved too far (>15 electrical degrees).	This indicates a poor motor phase angle was found by Wake and Shake. Revise Wake and Shake parameters, and re-run Wake and Shake.	Disable power stage
F492	Wake and Shake - Validating Comm. angle required more than MOTOR.ICONT	A current larger than MOTOR.ICONT was used to excite the motor.	This indicates one of the following: <ul style="list-style-type: none"> <li>Phase angle is incorrect due to a bad wake and shake.</li> <li>Motor has very high friction requiring high current to break free.</li> <li>Motor power cable is disconnected or improperly wired.</li> </ul>	Disable power stage
F493	Invalid commutation detected - motor accelerating in the wrong direction. Motor phase may be incorrect.	The velocity of the motor exceeded WS.CHECKV and the sign of the current was not equal to the sign of motor acceleration or the sign of motor velocity for a period of time larger than WS.CHECKT.	1. Check motor phase wiring 2. Re-configure wake and shake (if Mode 0 or 1 is used) 3. Re-run wake and shake to determine correct commutation angle	Dynamic braking

Fault	Message/Warning	Cause	Remedy	Drive Response to Fault
n495	Failed to process recorder cogging compensation table.	The drive was unable to retrieve or process the data gathered during the cogging compensation teach move.	Try starting another cogging compensation teach move. Should the warning continue to appear, contact customer support.	N/A
F501 n501	Bus over voltage.	Bus voltage too high. Usually, this problem is load related.	Reduce load or change motion profile. Check system regen capacity; add capacity if needed. Check mains voltage.	Disable power stage
F502	Bus under voltage. Warning issued prior to fault.	Bus voltage below threshold value.	Check mains voltage.	Controlled stop
F503	Bus capacitor overloaded.	Single phase AC input on a drive only rated for three-phase input or excessive single-phase power load.	Check mains voltage.	Controlled stop
F504 - F518	Internal supply voltage fault	Internal supply voltage fault detected	Check wiring for electromagnetic compatibility (EMC). If issue persists exchange drive.	
F519	Regen short circuit.	Regen resistor short circuit.	Regen IGBT short circuit. Contact technical support.	Disable power stage
F521 n521	Regen over power.	Too much power stored in regen resistor.	Either get larger regen resistor or use DC bus sharing to dissipate power.	Disable power stage
F523	Bus over voltage FPGA.	Bus over voltage hard fault.	Check mains voltage and check system brake capacity.	Disable power stage
F524 n524	Drive Foldback.	Maximum drive power has been exceeded. The power has been limited to protect the drive.	Motion requires too much power. Change profile to reduce load .	Controlled stop
F525	Output over current.	Current exceeds drive peak.	Check for short or feedback faults.	Disable power stage
F526	Current sensor short circuit.	1. Current sensor short circuit. 2. Motor cable plugged in upside down	1. Restart drive. If issue persists, contact technical support. 2. Plug in cable right-side up.	Disable power stage
F527	Iu current AD converter stuck.	Hardware failure detected.	Restart drive. If issue persists, contact technical support.	Disable power stage
F528	Iv current AD converter stuck.	Hardware failure detected.	Restart drive. If issue persists, contact technical support.	Disable power stage

Fault	Message/Warning	Cause	Remedy	Drive Response to Fault
F529	Iu current offset limit exceeded.	Hardware failure detected.	Restart drive. If issue persists, contact technical support.	Disable power stage
F530	Iv current offset limit exceeded.	Hardware failure detected.	Restart drive. If issue persists, contact technical support.	Disable power stage
F531	Power stage fault.	Hardware failure detected.	Restart drive. If issue persists, replace drive.	Disable power stage
F532	Drive motor parameters setup incomplete.	Before a motor can be enabled, you must configure a minimum set of parameters. These parameters have not been configured.	Issue the command <code>DRV.SETUPREQLIST</code> to display the list of the parameters that you must configure. Configure these parameters either manually or automatically. You can manually configure these parameters in three ways: (1) set each parameter individually; (2) use the setup wizard to select the motor; or (3) select the motor type from the motor data base in the Motor window (MOTOR.AUTOSSET must be set to 0 (off)). If you use the Motor window, you must first select the feedback type. If the motor has Biss Analog, Endat, or SFD feedback (feedback with memory), then these parameters are set automatically when MOTOR.AUTOSSET is set to 1 (on).	Disable power stage

Fault	Message/Warning	Cause	Remedy	Drive Response to Fault
F534	Failed to read motor parameters from feedback device.	Motor either does not have motor feedback memory, or the motor feedback memory is not programmed properly so the parameters cannot be read.	Try to read parameters again by clicking the <b>Disable</b> and <b>Clear Faults</b> button, or by issuing the DRV.CLRFAULTS command. If this attempt is not successful, then set MOTOR.AUTOSSET to 0 (off) and program the parameters using the setup wizard or manually set up the parameters. If the motor has motor memory (Biss Analog, Endat, and SFD motors have motor memory), return the motor to have the memory programmed.	Dynamic braking
F535	Power-board over-temperature fault.	The power-board temperature sensor indicates more than 85 °C.	Reduce the load of the drive or ensure better cooling.	Disable power stage
F536	Standby power supply fault.	Standby voltage circuit overloaded.	Check total 24 V power load of AKD-N in the strings (sum of drive and motor brake supply). The AKD-C must be power-cycled to recover from this fault.	Disable Drives
F537	Precharge fault.	Precharge process could not be performed in a reasonable amount of time.	Look for a shortcut in the string (cable) or exchange hardware	Disable Drives and Unpower Strings
F541 N541	AC input phase 1 missing.	Mains supply failure detected, phase L1 missed on AKD-C.	Check power connector and power source.	Disable Drives and Unpower Strings
F542 N542	AC input phase 2 missing.	Mains supply failure detected, phase L2 missed on AKD-C.	Check power connector and power source.	Disable Drives and Unpower Strings
F543 N543	AC input phase 3 missing.	Mains supply failure detected, phase L3 missed on AKD-C.	Check power connector and power source.	Disable Drives and Unpower Strings

Fault	Message/Warning	Cause	Remedy	Drive Response to Fault
F545	String current over peak limit	String current is higher than AKD-C Rated Peak Current.	Lower AKD-N current limits to prevent overdrawing AKD-C current	Disable Drives and Unpower Strings
F546	String current over continuous limit	String current is higher than AKD-C Rated Continuous Current (I <sup>2</sup> T).	Lower AKD-N current limits to prevent overdrawing AKD-C current	Disable Drives and Unpower Strings
F560	Regen near capacity, could not prevent over voltage.	An F501 Bus Over Voltage has occurred while the Regen Resistor was at or above 75% of its dissipation capacity.	Increase the size of regen resistor to be able to dissipate more power.	Disable power stage
F561	More than 8 AKD-Ns connected at string2	Too many drives on string 2.	Reduce NSDs on String 2 to 8 or less	Disable Drives and Unpower Strings
F562	More than 8 AKD-Ns connected at string1	Too many drives on string 1.	Reduce NSDs on String 1 to 8 or less	Disable Drives and Unpower Strings
F564	Number of connected nodes on string 1 has decreased.	Drive has been removed from string 1.	Investigate AKD-N Ethercat communication, determine where network connection failed.	Disable Drives and Unpower Strings
F565	Number of connected nodes on string 2 has decreased.	Drive has been removed from string 2.	Investigate AKD-N Ethercat communication, determine where network connection failed.	Disable Drives and Unpower Strings
F570 N570	Phase loss.	Phase loss detected on HV48.	Check mains power voltage. Fault action configurable by <a href="#">FAULT570.ACTION</a> .	Disable power stage
n582	Velocity has been limited commutation speed to less than 600Hz to meet ECCN 3A225 requirements.	Motor Velocity has exceeded the allowed commutation speed (599Hz).	Refer to ECCN 3A225 Limitations for Induction Motors.	Velocity command will be clamped at ECCN 3A225 regulation.

Fault	Message/Warning	Cause	Remedy	Drive Response to Fault
F587	Loss of all AC input phases.	Mains supply failure detected.	Check power connector and power source.	Disable Drives and Unpower Strings
n601	Modbus data rate is too high.	Modbus controller data rate is too high.	Reduce data rate.	Disable power stage
F602	Safe torque off.	Safe torque off function has been triggered.	Reapply supply voltage to STO if safe to do so.	Disable power stage
n603	OPMODE incompatible with CMDSOURCE	This warning is generated when the drive is enabled and the gearing command source is selected at the same time as torque or velocity op-mode.	Select a different DRV.OPMODE and DRV.CMDSOURCE combination.	Disable power stage
n604	EMUEMODE incompatible with DRV.HANDWHEELSRC.	Emulated encode mode is incompatible with the selected handwheel source.	Select a compatible emulated encode mode or change handwheel source.	Disable power stage
F621	Control Board CRC fault.	Communications with the Power Board Failed	DRV.CLRFAULTS. If issue persists, contact technical support.	Disable power stage
F623	Power Board CRC fault.			
F624	Power Board Watchdog fault.			
F625	Power Board Communication fault.			
F626	Power Board FPGA not configured.			
F627	Control Board Watchdog fault.			
F628	AKD-C Front door packet not received on String 1.	A data packet has not been received by the AKD-N or AKD-C (String 1)	Check cables and clear the fault.	Disable Drives and Unpower Strings
F629	AKD-C Front door packet not received on String 2.	A data packet has not been received by the AKD-C (String 2)	Check cables and clear the fault.	Disable Drives and Unpower Strings
F630	FPGA cyclic read fault.	FPGA-to-firmware data access error.	DRV.CLRFAULTS. If issue persists, contact technical support.	Disable power stage


Fault	Message/Warning	Cause	Remedy	Drive Response to Fault
F631	Issue command timed out.	Processing a command took longer than the command timeout (10-60 sec depending on the command).	Try reducing the CPU load of the drive by deactivating unused features or changing the fieldbus cycle time.	Controlled stop
F701	Fieldbus Runtime.	Runtime communication fault.	Check fieldbus connections (X11), settings, and control unit.	Controlled stop
F702 n702	Fieldbus Communication lost.	All fieldbus communication was lost.	Check fieldbus connections (X11), settings, and control unit.	Controlled stop
F703	Emergency timeout occurred.	Motor did not stop in the timeout defined.	Change timeout value, change stop parameters, improve tuning.	Disable power stage
F706 n706	Fieldbus cyclic setpoints missing.	Fieldbus master has stop sending setpoints within a certain timeout values.	Check the fieldbus connection and wiring.	Controlled stop



### 3 PDMM and PCMM Errors and Alarms

When an [Error](#) or [Alarm](#) occurs, always check the controller log messages. The log messages will provide more details about the failure and the history of events leading up to the failure. From the log messages, you can determine the specifics about the cause of the failure to correct the underlying problem.

#### 3.1 PCMM and PDMM Errors

Code	Description	Cause	Remedy	Clear ‡
E01	Critical  temperature exceeded. The controller operation is stopped after 20 seconds, CPU will be put to sleep.	CPU temperature exceeded safe operating temperature limit.	Power-off. Check airflow and operating environment are within hardware specifications. Allow unit to cool before power-on.	HW
E02	Out of memory. KAS runtime is stopping.	Memory leak, memory corrupted, or hardware memory failure.	Power-off/on. If problem is recurrent, check release notes for firmware updates or return hardware for repair.	HW
E03	Fan failure.	CPU cooling fan was not able to operate properly.	Check temperature and monitor for High temp alarm (see A01). Return hardware for fan replacement.	HW
E10	Firmware is corrupted.	Flash memory corrupted during firmware download or flash hardware failure.	Re-download firmware or boot into recovery mode, download firmware, and power-off/on. If problem persists, return hardware for repair.	SW
E11	Flash is corrupted, no filesystem is available.	At startup the filesystem could not be mounted on the flash.	Reset to factory defaults. If problem persists, return hardware for repair.	SW
E12	Not enough flash memory available.	Flash memory is full, unable to write to flash.	Clean-up the flash memory by removing log files, application programs, recipes, or other data files.	SW
E13	Out of NVRAM space for <a href="#">retained variables</a> .	NVRAM is full.	Change application to reduce the amount of retained variables.	SW
E14	Reset to Factory Defaults failed.	Flash memory could not be formatted during a Reset to Factory Defaults procedure.	Try reset to factory defaults again from power-on. If problem persists, return hardware for repair.	SW
E15	Cannot read/write files from/to a SD card	SD card is not plugged in or the file system is corrupt and cannot be mounted. PLC function failures will not cause this error.	Insert a valid SD card or reformat the SD card using Settings > SD Card > Format button.	SW

Code	Description	Cause	Remedy	Clear ‡
E16	Not enough space available on the SD card	SD card is full, unable to write to the SD card. PLC function failures.	Clean-up the SD card space by deleting files or re-format the card using Settings > SD Card > Format button.	SW
E17	Cannot connect to a shared directory	Improper shared directory configuration on remote computer or PCMM/PDMM. Improper permissions, access control, or security policy for computer's share configuration. Computer is not accessible via Ethernet network.	Check if the computer's shared directory is accessible. Check and Apply the KAS Application->Shared Directory configuration or power-off/on the controller.	SW
E20	Runtime plug-in, process, thread or application failed to start.	KAS runtime or application code failed to auto-start at boot.	Power-off/on. Reset to factory defaults. If problem is recurrent, check release notes for firmware updates or download firmware.	HW
E21	Runtime process, thread, or driver failed to respond during operation.	KAS runtime code failed during normal operation.	Power-off/on. If problem is recurrent, check release notes for firmware updates.	HW
E22	Fatal error in PLC program, application stopped.	Virtual machine failed to execute an instruction.	Check the PLC application code for programming errors that could cause a fatal execution error, e.g. divide by zero, array out of bound, etc.. Check that the IDE and controller Runtime versions are compatible. Re-compile the application, download, and re-start.	SW
E23	CPU is overloaded. See <a href="#">CPU Overload (E23)</a> .	Either the motion engine did not complete or the PLC program did not complete within the timeout period due to excessive CPU load.	Stop the application or power-off/on. Reduce the sample rate, simplify the application, or reduce the application cycles and restart the application.	SW
E24	PLC application cannot be started	PLC application cannot be started, due to an existing condition. Possible reasons: <ol style="list-style-type: none"> <li>Maintenance operation is in progress.</li> <li>Controller is in <a href="#">Online Configuration Mode</a>.</li> <li>AKD Restore failed.</li> <li>The IDE version of the compiled PLC code and controller runtime version do not match.</li> <li>Previous download failed.</li> </ol>	Check the following: <ol style="list-style-type: none"> <li>Controller web-server home page for any maintenance operation in-progress. Wait for the operation to finish.</li> <li>Connect to the controller with the IDE and disable <a href="#">Online Configuration Mode</a>.</li> <li>EtherCAT network topology by using the Scan network button in the web-server's Restore tab. Correct the physical topology and re-execute an AKD restore.</li> <li>IDE version (only major.minor.micro) should match with runtime version. To correct, install the correct version of IDE or Runtime.</li> <li>Connect IDE and download application.</li> </ol>	SW

Code	Description	Cause	Remedy	Clear ‡
E30	EtherCAT communication failure during operational mode.	Network communication error. This is commonly caused by a loose or bad EtherCAT connection occurring after the network successfully starts up. See IDE Controller log for more information	<ul style="list-style-type: none"> <li>Read AKD parameter ECAT.DIAG for more information on where in the EtherCAT network the issue may be occurring. See <a href="#">Debugging Intermittent EtherCAT Communication Issues</a> on KDN for more information.</li> <li>Check the EtherCAT network wiring and devices state. Re-start the application.</li> </ul>	SW
E31	EtherCAT communication failure during preop mode.	EtherCAT network operation failed due to a network communication error.	Check the EtherCAT network wiring and devices state. Re-start the application.	SW
E32	EtherCAT communication failure during bootstrap mode.	EtherCAT network operation failed due to a network communication error.	Check the EtherCAT network wiring and devices state. Re-start the application.	SW
E33	EtherCAT failed to initialize into operational mode.	EtherCAT network initialization failed. This is commonly caused by the Ethercat configuration in the project not matching the actual hardware. See IDE Controller log for more information.	Check the EtherCAT network wiring and devices state. Re-start the application.	SW
E34	EtherCAT failed to initialize into preop mode.	EtherCAT network initialization failed due to a network communication error.	Check the EtherCAT network wiring and devices state. Re-start the application.	SW
E35	EtherCAT failed to initialize into bootstrap mode.	EtherCAT network initialization failed due to a network communication error.	Check the EtherCAT network wiring and devices state. Re-start the application.	SW
E36	EtherCAT failed to discover the expected devices.	EtherCAT network discovery failed due to a mismatch between the discovered and expected devices.	Check the EtherCAT devices and wiring order. Correct the device order wiring or re-scan the network, re-compile, and download the updated application. Re-start the application.	SW
E37	EtherCAT failed to return to init state.	EtherCAT network initialization failed due to a network communication error.	Check the EtherCAT network wiring and devices state. Re-start the application.	SW
E50	Backup to SD card failed	An unrecoverable error occurred during the backup operation.	Repeat the backup to SD card operation. If it fails again, replace the SD card.	SW
E51	Restore from SD card failed	An unrecoverable error occurred during the restore operation.	<b>Do not reboot the Controller!</b> Repeat the restore operation. If it fails again, reset the Controller to factory defaults. If the problem persists, return hardware for repair.	SW
E52	SD Backup files are missing or corrupt	The restore operation failed due to missing, incomplete, or corrupt files on the SD card.	Perform a backup operation before the restore or use and SD card with valid backup files.	SW

Code	Description	Cause	Remedy	Clear ‡
E53	SD Backup files are not compatible	Backup files on the SD card are not compatible.	Use a different SD card with Backup file(s) from a compatible controller.	SW

‡ Items labeled "SW" can be cleared from the web server. Items labeled "HW" require a reboot to be cleared.

### 3.2 PCMM and PDMM Alarms

Code	Description	Cause	Remedy	Clear ‡
A01	High temperature exceeded	CPU temperature near the safe operating temperature limit.	Check airflow and operating environment are within hardware specifications.	SW
A02	Low on memory.	Memory leak or corruption.	Power-off/on. If problem is recurrent, check release notes for firmware updates or return hardware for repair.	SW
A04	Low input voltage	+24 volt input power is +19 volts or less.	Check power supply voltage and connection to the controller.	SW
A12	Flash memory is low on free space.	Flash memory is almost full.	Clean-up the flash memory by removing log files, application programs, recipes, or other data files. Reset to factory defaults.	SW
A21	Recoverable process or thread failed to respond during operation.	KAS non-runtime code failed during normal operation and was automatically restarted.	If problem is recurrent, power-off/on. Check release notes for firmware updates.	SW
A23	CPU is heavily loaded	CPU usage is too high for 5 (or more) seconds.	Reduce the sample rate, simplify the application, or reduce the application cycles.	SW
A30	EtherCAT missed a send frame during operation mode.	EtherCAT master was unable to send a frame for one or more cycles.	Reduce the controller CPU load, so it has enough Real-Time margin to send EtherCAT frames every cycle.	SW
A31	EtherCAT received a frame with a wrong Working Counter value.	<ul style="list-style-type: none"> <li>The slave EtherCAT device does not exist or cannot be physically reached due to connector/cable failure.</li> <li>Slave hardware failure</li> <li>Slave is still busy with a previous command and is not ready.</li> </ul>	<ul style="list-style-type: none"> <li>Check the EtherCAT cables and the connectors.</li> <li>Check the EtherCAT devices for any device errors.</li> </ul>	
A38	EtherCAT missed a receive frame during operation mode.	EtherCAT master did not receive, or received too late, a frame for one or more cycles.	<ul style="list-style-type: none"> <li>Read AKD parameter ECAT.DIAG for more information on where in the EtherCAT network the issue may be occurring. See <a href="#">Debugging Intermittent EtherCAT Communication Issues</a> on KDN for more information.</li> <li>Check the EtherCAT network wiring and devices, or decrease the EtherCAT cycle rate.</li> </ul>	SW

Code	Description	Cause	Remedy	Clear ‡
A40	Local digital IO missed a cyclic update	Local digital IO was not updated during a cycle or the updates are no longer synchronous.	Reduce the sample rate, simplify the application, or reduce the application cycles.	SW
A53	The Controller was replaced with a higher performance model.	The 1.2GHz model was restored using backup files from an 800MHz model.	Either replace the controller with an 800MHz model or use the functionally compatible, higher performance 1.2GHz model.	SW

‡ Items labeled "SW" can be cleared from the web server. Items labeled "HW" require a reboot to be cleared.

## About KOLLMORGEN

Kollmorgen is a leading provider of motion systems and components for machine builders. Through world-class knowledge in motion, industry-leading quality and deep expertise in linking and integrating standard and custom products, Kollmorgen delivers breakthrough solutions that are unmatched in performance, reliability and ease-of-use, giving machine builders an irrefutable marketplace advantage.



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**North America**  
**KOLLMORGEN**  
201 West Rock Road  
Radford, VA 24141, USA

**Web:** [www.kollmorgen.com](http://www.kollmorgen.com)  
**Mail:** [support@kollmorgen.com](mailto:support@kollmorgen.com)  
**Tel.:** +1 - 540 - 633 - 3545  
**Fax:** +1 - 540 - 639 - 4162

**Europa**  
**KOLLMORGEN Europe GmbH**  
Pempelfurtstr. 1  
40880 Ratingen, Germany

**Web:** [www.kollmorgen.com](http://www.kollmorgen.com)  
**Mail:** [technik@kollmorgen.com](mailto:technik@kollmorgen.com)  
**Tel.:** +49 - 2102 - 9394 - 0  
**Fax:** +49 - 2102 - 9394 - 3155

**South America**  
**KOLLMORGEN**  
Avenida João Paulo Ablas, 2970  
Jardim da Glória, Cotia – SP  
CEP 06711-250, Brazil

**Web:** [www.kollmorgen.com](http://www.kollmorgen.com)  
**Mail:** [contato@kollmorgen.com](mailto:contato@kollmorgen.com)  
**Tel.:** +55 11 4615-6300

**China and SEA**  
**KOLLMORGEN**  
Floor 4, Building 9, No. 518,  
North Fuquan Road, Changning District,  
Shanghai 200335, China

**Web:** [www.kollmorgen.cn](http://www.kollmorgen.cn)  
**Mail:** [sales.china@kollmorgen.com](mailto:sales.china@kollmorgen.com)  
**Tel.:** +86 - 400 661 2802