Engineering Center
Five Farm Springs
Farmington, CT 06032

OTIS

| | | | | | |
|---|---|---|---|---|---|
| Original Date: | 2002-08-05 | | | Document: | 55661 |
| Project Number: | D324 | CA Number: | N/A | Sheet 1 of | 213 |
| Dwg / Part No: | N/A | | | | |

# Global Drive Operating Manual

*This document contains technical data the export of which is restricted by the EAR, diversion contrary to U.S. law is prohibited. Proper authorization is required prior to providing this technical data to any other company, entity, person, or destination. U.S. ECCN: EAR99*

**DISTRIBUTION: Per notification document 53627.**

**ORIGINAL APPROVAL:**

| **Prepared By:** (Last, F I typed) | (Signature and date) | **Approved By:** (Last, F I typed) | (Signature and date) |
|---|---|---|---|
| Agirman, I. | *Ismail Agirman 2/16/05* | Czerwinski, C. | *Chris Czerwinski 2/16/05* |
| Brooks, W. | *William F. Brooks 2/16/05* | | |
| Czerwinski, C. | *Chris Czerwinski 2/16/05* | | |
| Izard, J. | *Jeff M. Izard 2/16/05* | | |
| Mejias, N. | *Noel Mejias 2/16/05* | | |
| Piedra, E. | *Edward Piedra 2/16/05* | | |
| Schönauer, U. | *William F. Brooks 2/16/05* | | |

**REVISION APPROVAL RECORD:**

| Rev Date (yyyy-mm-dd) | Project/ PC | **Revised By:** (Last, F I typed) | **Approved By:** (Last, F I typed) | (Signature and date) |
|---|---|---|---|---|
| 2019-06-17 | D324 | Walden, Peter<br>Piedra, Ed<br>Czerwinski, C.<br>Schoenauer, U.<br>Furuta.S | Czerwinski, C. | *Chris Czerwinski, 06/17/2019* |

| | |
|---|---|
| Description of Change | Added 932 SBSB Fault**,** 6LS-TYP 0-2, Fan Duty Idle %, Sequenced Brk0/1, SBSB Vel mm/s, SBSB Motor Trq %, SBSB Regen Trq%, engineering test 610, motor type 511. Added descriptions for Advanced Hovering Control. Added DDP sec, ARD DDP sec, ERO Type 0/1, TCI Pos Limit, ARD LRT AC Lv PU.<br>Updated Section 6.4.2."Event-Specific Data", added "544 Torq Obs Flt", "Torq Obs Err % ", "LvlAccThresholds", DAT signals: Torque I Obs, Trq I Obs Fil ,Trq I Err Fil, Trq I Obs Err, Trq Obs Err %.<br>Menu 5-8 Overspeed Test.<br>Added Nom Speed 1500 to Minimal LS distance table in Section 4.7.<br>Adapted references to "UCM-EN on/off"=1 for UCM-EN brake monitoring.<br>Updated description for "ARD Operation"<br>Added Sec.9.1, 9.2 for SM160, SM260 motor parameter<br>Updated Section 2.3.1 "Method for Updating EEPROM Parameters"<br>Changed minimum values for "Vel Stop mm/sec" and "Vel Inr wc rad/s" |
| Reason for Change | **For** for **AAA30924MAE**. |

# Table of Contents

# 1 Introduction

## 1.1 Applicable Hardware Configurations

This document contains information for the Otis Gen2-R2 Modular Regenerative Drive. The processor board (Global Drive Control Board – GDCB) version covered by this document is:

- Processor Board: Axx26800AKT

## 1.2 Applicable Software Versions

This document covers software AAA30924MAE. Applicability to other SCN's is uncertain.

## 1.3 References

1. "*Interface Control Document for the Motion Command Sub System, Drive and Brake Control Sub System*", Otis document number 51081.
2. "Interface Control Document for RS422 Interface between TOC and MR Drive". Otis document number 51081
3. "*MCBIII Messages, Version 1.0*", Otis Document 54441.
4. *"Design Requirements Specification Gen2 Regenerative Drive Processor Board"*, Otis document number 55724.
5. *"Software Requirements Specification for Gen2 Modular Regenerative Drive"*, Otis document number 55658.
6. *"Gen2 Modular Regenerative Drive Software Design Document",* Otis document number 55659.
7. "*Modular Elevator Control System Service Tool*", Flohr Otis document number 9693B. [SVT].
8. Standard Work Process 1.1.12.0-1, "*Construction Startup Procedure for E311 VF(GEM/MVS)*".
9. "*MCB III GeN2 Service Tool Manual*", Field Component Manual, Otis Engineering Center, Berlin.

## 1.4 Abbreviations, Acronyms and Terms

The following abbreviations, acronyms and terms are used in this document:

| | |
|---|---|
| ADC | Analog to Digital Converter |
| AHC | Advanced Hovering Control |
| CAN | Controller Area Network |
| CRC | Circular Redundancy Check |
| CEIB | Communication and Encoder Interface Board (Axx26800AQN) |
| DBD | Drive Block Disconnect |
| DIB | Down Inspection Button |
| DDP | Delayed Drive Protection |
| DSP | Digital Signal Processor |
| GDCB | Global Drive Control Board (Axx26800AKT) |
| eI2C | enhanced I2C EEPROM storage capability |
| ESTOP | Emergency Stop |
| LS | Limit Switch |
| LWSS | Load Weight Subsystem |
| MCSS | Motion Command Subsystem; Applies to MCSS and LMCSS |
| MR | Machin Room |
| NTSD | Normal Terminal Stopping Device |
| PLL | Phase Lock Loop |
| PRS | Position Reference System |
| PTR | Prepare To Run signal from MCSS |
| RTR | Ready to Run signal declared by DBSS and sent to MCSS. |
| SCN | Software Configuration Number (i.e. AAA30924AAB) |
| SVT | Service Tool |
| TCB | Traction Control Board |
| TOC | Top Of Car |
| UIB | Up Inspection Button |

## 1.5 Conventions Used in this Document

- The default paragraph text is 10 pt. Arial font.
- `10pt. Courier New` is used to indicate service tool text.
- All headings and parameters are cross-referenced throughout the document so that heading text is entered only once, where the detail descriptions are located.

# 2 Software Release Notes

## 2.1 Software Modifications

Refer to the applicable Software Configuration Release Document's.

**Attention**: AAA30924MAA requires GDCB version AEA26800AKT which has 4Mbit serial flash device.

## 2.2 Known Bugs

3 levels of software bug severity are identified:

**MAJOR**: Misoperation could cause callback or impact safety.
**MINOR**: Possible misoperation will not cause callback or impact safety.
**TRIVIAL**: No impact on performance or operation.

All known bugs are listed. Software release criteria dictates that a release shall not take place if a Major bug is known to exist.

1. TRIVIAL: There is a minor bug with the SVT display for the fault "`516 Corr failed`". The fault response in the SVT is shown as ESTOP, when it is actually DECEL. This will be corrected by SCR# 30924-1067.
2. TRIVIAL: There is a minor bug with the SVT display for the fault "`702 Prechrg Time`". The fault response in the SVT is shown asWARN, when it is actually ESTOP. This will be corrected by SCR# 30924-1068.
3. TRIVIAL: The saced event log may not be correct after a software upgrade. It the event log is needed it is recommended to record the event log before software upgrade. It is also recommended to clear the event log after software upgrade. SCR 2039 was enetered for this issue.

## 2.3 Required EEPROM Changes For Drive Software Upgrade

### 2.3.1 Method for Updating EEPROM Parameters

Drives being upgraded to this Software Configuration Number may require some EEPROM parameter values to be changed or added.

**NOTE**: It is strongly recommended that a copy be made of the currently working EEPROM. After copying, set aside the original EEPROM and install the newly made copy.

Initially, the following fault may occur in menu **2 EVENT LOG**:

```
705 E2 Invalid
000:00:00:00.04
```

The reason for this is the data in the EEPROM is set to values incompatible with the current SCN or that new EEPROM parameters have not yet been set. The invalid or blank values must be corrected.

➔ **Pressing SHIFT_ENTER tells which parameter is invalid and what menu it is located.**

A specific parameter can be easily set to its default value as described below:
**➔ press SHIFT-7 (D) to prepare a default value to be entered in the SVT edit field,**
**➔ press ENTER to accept this value (same as the value would have been entered manually).**

Note: this procedure works only if the specific parameter has a defined default value.

## 2.3.2 Which parameters need to manually set

Which parameters that need to be manually set depends on which software version that is being upgrading from.

To determine which parameters need to be manually set, please see the table below and find the column corresponding to the old software version that is being upgraded from. The parameters marked with an “X” in that column are the parameters that need to be set manually after upgrading to the new software version.

| AAA30924MAE (A4330924MAE) | | | | | | | Parameters that may need to be manually set when upgrading from: | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 31 SETUP | Menu | Min | Max | Default | Actual | Access Level | AP130924MAD | AAA30924MAD | AP130924MAC | AAA30924MAC | AP330924MAB | AP230924MAB | AP130924MAB | AAA30924MAB | AP130924MAA | AAA30924MAA |
| *ARD Operation | 31 | 0 | 2 | 0 | | 2 | | x | x | x | x | x | x | x | x | x |
| *ARD DDP sec | 31 | 270 | 600 | 270 | | 2 | | x | x | x | x | x | x | x | x | x |
| *ERO type 0/1 | 31 | 0 | 1 | 0 | | 2 | | x | x | x | x | x | x | x | x | x |
| *TCI Pos Limit | 31 | 0 | 1 | 0 | | 2 | | x | x | x | x | x | x | x | x | x |
| *AHC Enable 0/1 | 32 | 0 | 1 | 0 | | 2 | x | x | x | x | x | x | x | x | x | x |
| *TOC Car Dir 0/1 | 32 | 0 | 1 | 0 | | 2 | x | x | x | x | x | x | x | x | x | x |
| *AHC Kp gain | 32 | 0 | 10 | - | | 2 | x | x | x | x | x | x | x | x | x | x |
| *AHC Kd gain | 32 | 0 | 5 | - | | 2 | x | x | x | x | x | x | x | x | x | x |
| *AHC Kd RedFactor | 32 | 0 | 4 | -1 | | 2 | x | x | x | x | x | x | x | x | x | x |
| *AHC Notch frq Hz | 32 | 0 | 2.3 | - | | 2 | x | x | x | x | x | x | x | x | x | x |
| *AHC Ln Enc Th mm | 32 | 0 | 2000 | - | | 2 | x | x | x | x | x | x | x | x | x | x |
| *AHC Nm Enc Th mm | 32 | 0 | 2000 | - | | 2 | x | x | x | x | x | x | x | x | x | x |
| *AHC Enc/Vn Th mm | 32 | 0 | 200 | - | | 2 | x | x | x | x | x | x | x | x | x | x |
| *AroMRo Delay Sec | 32 | 10 | 120 | 10 | | 2 | | | | x | x | x | x | x | x | x |
| *Inv NTSD Ilimit% | 32 | 0 | 88 | 88 | | 2 | | | | | | | | | x | x |
| *MaskOut Warning1 | 32 | 0 | 999 | 0 | | 2 | | | | x | x | x | x | x | x | x |
| *MaskOut Warning2 | 32 | 0 | 999 | 0 | | 2 | | | | x | x | x | x | x | x | x |
| * Fan Duty Idle % | 32 | 3 | 100 | 100 | | 2 | x | x | x | x | x | x | x | x | x | x |
| *In Car noLoad kg | 33 | 80 | 200 | 80 | | 2 | | | | | | | | | x | x |
| *Self BTI Block | 33 | 0 | 2 | 0 | | 2 | | | | | | | | | x | x |
| *Check Unbalance | 33 | 0 | 1 | 0 | | 2 | | | | | | | | | x | x |
| *Lockup by S-BTI | 33 | 0 | 1 | 0 | | 2 | | | | | | | | | x | x |
| *Brk DelayTime ms | 33 | 0 | 10000 | 1500 | | 2 | | | | | | | | | x | x |
| *Brk Pick V % | 33 | 0 | 100 | 70 | | 2 | | | x | x | x | x | x | x | x | x |
| *Brk Hold V % | 33 | 0 | 100 | 40 | | 2 | | | x | x | x | x | x | x | x | x |
| *Sequenced Brk0/1 | 33 | 0 | 1 | 0 | | 2 | x | x | x | x | x | x | x | x | x | x |
| *SBSB Vel mm/s | 33 | 0 | 3000 | 2500 | | 2 | x | x | x | x | x | x | x | x | x | x |
| *SBSB Motor Trq % | 33 | 29 | 125 | 125 | | 2 | x | x | x | x | x | x | x | x | x | x |
| *SBSB Regen Trq % | 33 | 0 | 79 | 0 | | 2 | x | x | x | x | x | x | x | x | x | x |
| * LRT AC Level PU | 34 | 0.01 | 0.5 | 0.06 | | 2 | | | | | | | | | x | x |
| *ARD LRT AC Lv PU | 34 | 0.01 | 0.5 | 0.06 | | 2 | | x | x | x | x | x | x | x | x | x |
| *GovOverSpd mm/s | 35 | 0 | 16000 | 0 | | 2 | x | x | x | x | x | x | x | x | x | x |
| *TerminalPhase mm | 35 | 0 | 25000 | 0 | | 2 | | | | x | x | x | x | x | x | x |
| *TerminalPhs mm/s | 35 | 10 | 8000 | 300 | | 2 | | | | x | x | x | x | x | x | x |
| *Cnv PWM freq Hz | 36 | 2000 | 10000 | 10000 | | 2 | | | | | | | | | x | x |
| *Inv PWM freq Hz | 36 | 2000 | 10000 | 10000 | | 2 | | | | | | | | | x | x |
| *Cnv Hrmnc On 0/1 | 36 | 0 | 1 | 1 | | 2 | | | | | | | | | x | x |
| *Vel Inr wc rad/s | 61 | 0 | 10 | 2 | | 2 | x | x | x | x | x | x | x | x | x | x |
| *Torq Obs Err % | 61 | 0 | 100 | 0 | | 2 | x | x | x | x | x | x | x | x | x | x |
| *EngTest Param F1 | 62 | 0 | 99999 | 0 | | 3 | x | x | x | x | x | x | x | x | x | x |
| *EngTest Param F2 | 62 | 0 | 99999 | 0 | | 3 | x | x | x | x | x | x | x | x | x | x |
| *EngTest Param F3 | 62 | 0 | 99999 | 0 | | 3 | x | x | x | x | x | x | x | x | x | x |
| *EngTest Param F4 | 62 | 0 | 99999 | 0 | | 3 | x | x | x | x | x | x | x | x | x | x |
| *EngTest Param F5 | 62 | 0 | 99999 | 0 | | 3 | x | x | x | x | x | x | x | x | x | x |
| *SSM Config | 62 | 0 | 0xFFFFFFFF | - | | 3 | | | | | x | x | x | x | x | x |
| *SSM PhantRPeriod | 62 | 0 | 0xFFFFFFFF | - | | 3 | | | | | x | x | x | x | x | x |
| *SSM MaxSlip | 62 | 0 | 0xFFFFFFFF | - | | 3 | | | | | x | x | x | x | x | x |
| *SSM MaxSlip2 | 62 | 0 | 0xFFFFFFFF | - | | 3 | | | | | x | x | x | x | x | x |
| *SSM MaxSlip3 | 62 | 0 | 0xFFFFFFFF | - | | 3 | | | | | x | x | x | x | x | x |
| *VTE LdRatio Hyst | 62 | 0 | 0xFFFFFFFF | - | | 3 | | | | | x | x | x | x | x | x |
| *VTE Hitch Strtch | 62 | 0 | 0xFFFFFFFF | - | | 3 | | | | | x | x | x | x | x | x |
| *VTE MaxErrSameEg | 62 | 0 | 0xFFFFFFFF | - | | 3 | | | | | x | x | x | x | x | x |
| *VTE MaxErrOtherE | 62 | 0 | 0xFFFFFFFF | - | | 3 | | | | | x | x | x | x | x | x |
| *VTE MaxDevFrmNom | 62 | 0 | 0xFFFFFFFF | - | | 3 | | | | | x | x | x | x | x | x |
| *LvlAccThresholds | 63 | 0 | 0xFFFFFFFF | -1 | | | x | x | x | x | x | x | x | x | x | x |

Microsoft Excel
97-2003 Worksheet

# 3 Drive Operation

## 3.1 Drive Modes

The Gen2 Regenerative Drive is designed to be compatible with both MCSS-type and TCBC-type controllers. As a result, two of the fundamental operating modes of the drive are *MCSS mode* and *CAN mode*. The setting of the service tool parameter Interface Type specifies which controller is to be used and determines the fundamental operating mode. The mode determines the source of the motion commands and other functionality of the drive. Additionally, there are sub-modes, each of which is described below.

### 3.1.1 MCSS Mode

*MCSS mode* is the normal operating mode when the drive is to be used with an MCSS-type controller. The mode has to be selected using the service tool parameter Interface Type. In MCSS mode, the velocity reference is obtained from the MCSS-type controller according to the MCSS ICD [1]. The drive has to be connected to the MCSS-type controller via the RS-422 serial interface.

### 3.1.2 Manual Mode

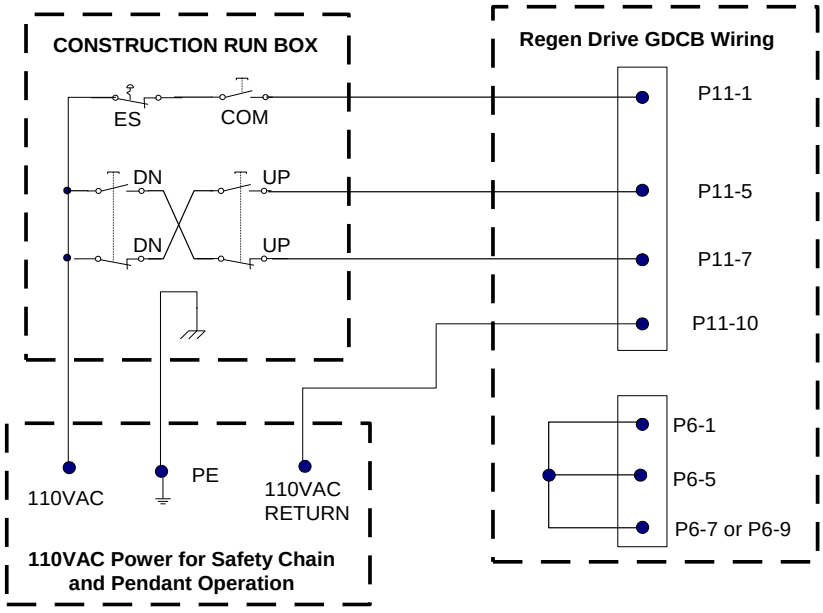
Manual mode is a sub-mode, available only when *MCSS mode* is selected. Manual mode is intended for use only during installation. The Manual Mode velocity profile is determined by the setting of EEPROM parameters in menu 3-5 PROFILE. There are no acceleration or deceleration limits other than these EEPROM settings. An overspeed trip is also provided and is based on the following parameters in menu 3-5 PROFILE

```
Man Speed    mm/s
                <>
```

and menu **3-2 ADJUSTMENT**:

```
MAN Overspeed  %
                <>
```

The safety chain must be provided to the drive and the manual mode pendant should be wired as shown in the following diagram or Manual mode operation is not possible.




Two restrictions are placed on the operation of the up and down command inputs:

1. Both up and down inputs cannot be asserted at the same time. If stopped, the drive will not run; if moving the drive will decelerate and stop even if the opposite direction input is de-asserted while the drive is decelerating.
2. While running, if the asserted input is released the drive will decelerate and stop even if the input is reasserted while the drive is decelerating.

### 3.1.3 CAN Mode

*CAN mode* is the operating mode when the drive is to be used with a TCBC-type controller. The mode has to be selected using the service tool parameter Interface Type. In CAN mode, start and stop commands are obtained from the controller according to the CAN ICD [2]. The drive has to be connected to the TCBC-type controller via the CAN serial interface. There are several sub-modes when the drive is set to CAN mode which include: *Normal, TCI / ERO, Correction, Rescue*, and *Learn.*

### 3.1.4 Engineering Test Modes

Special test modes can be activated by using the engineering version of the Data Acquisition Tool (DAT), Software Configuration Number AAA30959XXX. For a complete list of the test mode operating instructions, see Section 8.

## 3.2 Drive States

The drive has several states that characterize the status of the drive and the distinct portions of the motion profile. The table below describes the drive states. The drive state can be monitored using the service tool menu **1-1 STATUS.**

| Internal Drive State | Description | Actions |
|---|---|---|
| **Init** | Initialization state. | • Indentify drive type by reading EEPROM in power section, if available. If not, use GDCB EEPROM parameter Drive Type. |
| **Power Down** | In this state, the power section is disconnected from the AC mains. This state is entered when the drive is first powered-on. If the AC line is valid, then the state advances to the **Pre-charge** state.<br><br>In CAN mode, this state can also be entered when commanded to via the DrivePowerDown message to save energy (sleep mode). The drive exits PowerDown when commanded by the DrivePowerDown message | • Disable PWMs<br>• De-energize Safety (SX) relays<br>• Open main (MX) contactor.<br>• Open pre-charge (PX) contact.<br>• Close discharge (DX) contact. |
| **Pre-charge** | This is the state of the drive while the DC bus is charging. When precharge is complete, the state advances to either **Wait for Safety or Idle**, depending on the safety chain. If the bus does not charge in a certain amount of time, the **Power Down** state is re-entered. | • Close pre-charge (PX) contact.<br>• Open discharge (DX) contact.<br>• Close main (MX) contactor when pre-charge complete. |
| **ShutDown** | This state is entered after certain faults have occurred (see **DECEL**, **ESTOP**, **COMP** faults). The drive stays in this state until motion has stopped and 2 seconds have elapsed. The drive will NOT attempt another run until the fault condition clears. When the fault clears, the state advances to **Wait for Safety or Idle** .depending on the safety chain. Also, if the drive was previously commanded to Power Down, the drive will advance to **PowerDown**. | • Send stop and shutdown request (SAS) to MCSS if certain critical faults have occurred.<br>• Disable PWMs<br>• De-energize Safety (SX) relays<br>• Main contactor (MX) may be dropped for I critical faults. |
| **Wait for Safety** | This state is entered when the safety chain is open. If the safety chain closes, the state will advance to **Idle**. | • Disable PWMs<br>• De-energize Safety (SX) relays |
| **Idle** | This state is entered when there is no demand, the safety chain is made, and certain faults have not occurred. If there is demand, the state advances to**Prepare To Run**. | • Disable PWMs<br>• De-energize Safety (SX) relays |
| **Prepare To Run** | This state is entered when prepare to run (PTR) command is activated. When complete, the drive advances to **Ready To Run**. | • Energize Safety (SX) relays<br>• Enable PWM<br>• Establish flux in machine (ramp magnetizing current in induction motor or run locked-rotor test if necessary for PM motor) |

| | | |
|---|---|---|
| **Ready To Run** | In this state, the drive waits for the lift brake command. When the lift brake command is received, the state advances to **Lift Brake**.<br>*In CAN Mode w ABL*:<br>Waits for Lift Brake Command<br>*In CAN mode w/o ABL*:<br>Automatically advaces to **Lift Brake** | • Set ready to run (RTR) true. |
| **Lift Brake** | This state is entered when the lift brake (LB) command is activated. After the brake is lifted, the drive transitions to the **Running**state.<br>*In CAN Mode w ABL*:<br>Waits for DriveGoToLanding Command<br>*In CAN mode w/o ABL*:<br>Automatically advaces to **Running** | • Torque current ON<br>• Velocity regulator ON<br>• *CAN & Manual Mode only*: Position regulator ON<br>• Set pretorque level<br>• Lift brake<br>• Set brake lifted (BL) flag true |
| **Running** | This state is entered immediately after leaving the **Lift Brake** state. | • Allow non-zero velocity reference<br>• *CAN & Manual Mode only*: Profile generator ON |
| **Decel** | *CAN & Manual Mode only*: This state is entered immediately after leaving the **Running** state when the drive's profile generator begins deceleration | • Allow non-zero velocity reference<br>• Drive's profile generator is in the decelerating state |
| **Drop Brake** | This state is entered when:<br>• *MCSS mode* : LB command is de-asserted.<br>• *CAN & Manual Mode*: position and velocity meet the stopping criteria at the end of the run.<br><br>Remains in this state until the brakes have dropped and post-torque ramp down has completed. It then advances to **Idle**. | • Drop brake<br>• *CAN & Manual Mode only*: Position regulator & profile generator OFF<br>• Ramp torque down to zero<br>• Notifies the brake has dropped<br>• MCSS *mode*: Remains here until PTR is de-asserted.<br>• *CAN Mode w ABL:*<br>Waits for EndRun command.<br>• *CAN Mode w/o ABL:*<br>Advances directly to **Idle** |
| **Brake Torque Test** | This state is applicable to all system when the Brake Maintenance tool is used.<br>This state is entered when<br>• MCSS mode: Brake Test of Drive command is set with SVT and Brake Test of MCSS command is received.<br>• Manual mode: Brake Test of Drive command is set with SVT.<br>• CAN Mode: Brake Test of Drive command is set with SVT and Brake Test of OCSS command is received.<br>When Brake Test mode is ended, the Drive state advances to Idle. | • Set ready to run (RTR) true.<br>• Torque current ON<br>• LB OFF |
| **Brake Open Test** | This state is applicable only for JIS application and HSOVF Drive when the Brake Open tool is used.<br>When Brake Test mode is ended, the Drive state advances to Idle. | • LB ON |

# 4 Installation and Startup

## 4.1 Requirements

Starting up the Gen2 Regenerative Drive should be performed by authorized personnel only. The mechanical assembly of the hoistway and the cab as well as the electrical installation in the hoistway, controller, and E&I panel have to be finished to ensure successful inspection run. The encoder has to be mounted at the machine and properly connected to the drive. The electrical connections have to be completely installed and checked.

## 4.2 Wiring Guidelines for 422 Interface

The regenerative drive can be located at a significant distance from the controller without extreme wiring measures by using the following basic guidelines:

1) Treat the drive chassis, machine, and encoder cable as noise sources.
2) Treat the controller cabinet as a quiet ground reference.
3) The encoder cable shield should be connected to the drive chassis (via GDCB connector P9-8).
4) Do NOT connect the encoder cable shield to the controller cabinet.
5) RS422 communication wires between the controller and the drive should be shielded twisted pairs.
6) Connect the RS422 communication cable shield to the controller cabinet (quiet ground reference).
7) The Drive to MCSS differential encoder signals should be shielded twisted pair wires.
8) Connect the Drive to MCSS differential encoder cable shield to the controller cabinet (quiet ground reference).

In addition to the preceding guidelines, the routing of the earth ground connection must be considered. The earth ground connection should first go to the drive, then to the controller. This allows any common mode noise current to be shunted to earth without having the opportunity to induce a common mode voltage between the drive and the controller.

## 4.3 Parameter Setup

Most parameters have already been set to default values. However, in order to enable the drive to run, the following parameters must be set according to the contract:

- All parameters in service tool menu **3-1 CONTRACT**
- All parameters in service tool menu **3-5** PROFILE

Refer to Section 6.7 for the detailed descriptions for the parameters in the above menus.

Since the Gen2 Regenerative Drive is compatible with MCSS-type and TCBC-type controllers, some parameters are not applicable and do not have to be set, depending on which controller is used. The parameter Interface Type specifies the type of controller being used. If certain parameters do not have to be set, they will not be visible in the service tool.

All applicable parameters noted above must be set before the drive is allowed to run. If not, the following error message will be visible in the event log:

```
705 E2 Invalid
000:00:00:00.04
```

If this occurs, press SHIFT-ENTER to determine which parameter has not been set.

## 4.4 Encoder Adjustment

The Gen2 Regenerative Drive performs an automatic encoder calibration at the beginning of the first run after power-up. During the calibration, the ***brake remains dropped*** and a test current is commanded in the motor to determine the magnet position of the rotor relative to the encoder. The test lasts for about 4 seconds, and is illustrated relative to other events in the timing diagram in the following Figure.

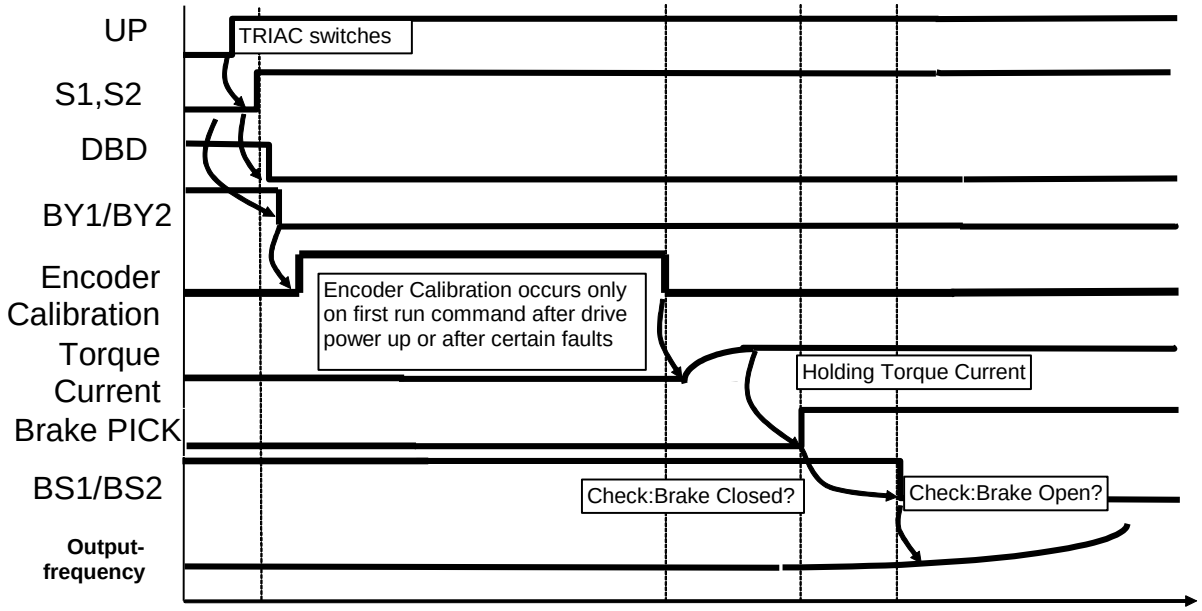



**Figure 1 Timing Diagram Showing Encoder Calibration (PM motors only)**

During the test, a tone may be heard from the motor. This is normal and to be expected. No user intervention is required during the automatic calibration. Note that the adjustment is automatically repeated after certain faults are detected.

When running the car on inspection after power-on, the inspection button must be held in for a minimum of 5 seconds in order for the Encoder Adjustment to complete. Inspection runs are not possible until the Enoder Adjustment is complete. The brake remains dropped during the encoder calibration procedure. Note: this is applicable for PM motor applications only.

## 4.5 Check of Direction

After setting the contract parameters, the direction and motor phasing needs to be checked by performing an inspection or manual run, depending on the controller being used:

- If Interface Type is set to MCSS-type, perform a manual run using the manual pendant.
- If Interface Type is set to TCBC-type, perform an inspection using ERO box.

If the car:

1. starts correctly in both directions and is following the inspection or manual mode profile:

-> continue with the next step in the startup routine.

2. starts in the incorrect direction but is following the profile:

   -> change the following parameter in service tool menu **3-2 ADJUSTMENT**:

   ```
   Car Dir      0/1
                <>
   ```

   then continue with the next step in the startup routine.

3. does not follow the profile and/or results in an ESTOP with any of the following faults:

   ```
   501 Pos Tracking
   000:00:00:00.04
   ```

   ```
   502 Vel Tracking
   000:00:00:00.04
   ```

   ```
   100 Inv SW Oct
   000:00:00:00.04
   ```

   -> it is likely that the motor phasing (relative to the encoder) is incorrect. The phasing can be changed manually by swapping two motor phases OR by changing the service tool parameter in menu **3-2 ADJUSTMENT:**

   ```
   Motor Phase  0/1
                <>
   ```

   After changing this parameter, repeat the test.

## 4.6 LEDs

There are 3 LEDs on the Drive Control Board near the service tool connector. If these LEDs are visible, depending on where the drive is located, the status of the LEDs can be checked. The LEDs have the following meanings:

| Status | Green (LED1) | Yellow (LED2) | Red (LED3) |
|---|---|---|---|
| DSP is in Reset | NOT FLASHING | NOT FLASHING | NOT FLASHING |
| DSP is Running | FLASHING | ANY STATE | ANY STATE |
| Car Moving Up | FLASHING | FLASHING | OFF |
| Car Moving Down | FLASHING | ON | OFF |
| Events in Log | FLASHING | OFF | FLASHING |

The yellow LED should correspond correctly with the car direction.

## 4.7 Check of 1LS/2LS

The required minimum length of 1LS / 2LS is determined by the adjusted Nom Speed mm/s and Decel mm/s2. The actually effective deceleration rate at correction runs or NTSD is increased by typ. 15%-20% versus regular profile deceleration.

| Nom Speed [mm/s] | Minimal 1LS / 2LS distance [mm] | | | | |
|---|---|---|---|---|---|
| | @ Decel = 500 mm/s² | @ Decel = 600 mm/s² | @ Decel = 800 mm/s² | @ Decel = 1000 mm/s² | @ Decel = 1200 mm/s² |
| **500** | 320 | 280 | 240 | 210 | 190 |
| **630** | 470 | 410 | 340 | 300 | 270 |
| **800** | 700 | 610 | 500 | 430 | 380 |
| **1000** | 1050 | 910 | 730 | 620 | 550 |
| **1200** | 1460 | 1260 | 1000 | 840 | 740 |
| **1500** | 2210 | 1890 | 1480 | 1240 | 1080 |
| **1600** | 2500 | 2130 | 1670 | 1390 | 1210 |
| **1750** | 2960 | 2520 | 1970 | 1640 | 1410 |
| **2000** | 3820 | 3240 | 2520 | 2080 | 1790 |
| **2500** | 5860 | 4950 | 3820 | 3140 | 2690 |
| **3000** | 8330 | 7030 | 5400 | 4420 | 3770 |
| **3500** | 11240 | 9460 | 7240 | 5910 | 5020 |
| **4000** | 14580 | 12260 | 9360 | 7620 | 6460 |
| **4500** | 18360 | 15430 | 11760 | 9550 | 8090 |
| **5000** | 22580 | 18950 | 14420 | 11700 | 9890 |
| **5500** | 27230 | 22840 | 17350 | 14060 | 11870 |
| **6000** | 32310 | 27090 | 20560 | 16650 | 14040 |
| **6500** | 37830 | 31700 | 24040 | 19450 | 16380 |
| **7000** | 43780 | 36680 | 27790 | 22460 | 18910 |
| | | | | | |

*Note: The above values include a margin of 0.1% of the exact (=SVT) minimum and are rounded up to the next multiple of 10*

If the drive is being used with TCBC-type controller (see parameter Interface Type), the drive limits TCI/ERO speed traveling towards the end of the hoistway within a LS to 0.15m/s:

- For the complete length of the LS if position is invalid.
- For the last 2m before the terminal landing if position is valid.

ERO/TCI runs away from the terminal are not limited, i.e. executed at Insp Speed mm/s.

To determine the minimum length for LS during installation, the following is recommended:

1. Set the profile to the contract speed and nominal deceleration, SVT parameters Nom Speed mm/s and Decel mm/s2 in M235.
2. Check the SVT parameter M217, LS length min mm to determine the minimum length for LS.
3. Set 1LS and 2LS to the required minimum length, plus an additional 20% (not to exceed 80%) for margin (this will avoid having to enter into the hoistway again after the installation if it is decided to decrease decel or jerk).
4. Perform the learn run.
5. Verify the learned lengths are correct via SVT parameters LS1 length mm and LS2 length mm in M217. Note: if they are incorrect, the drive should log the error 528 Profile Err in the event log indicating LS is not long enough for the selected deceleration rate. The fault is a log-only fault.

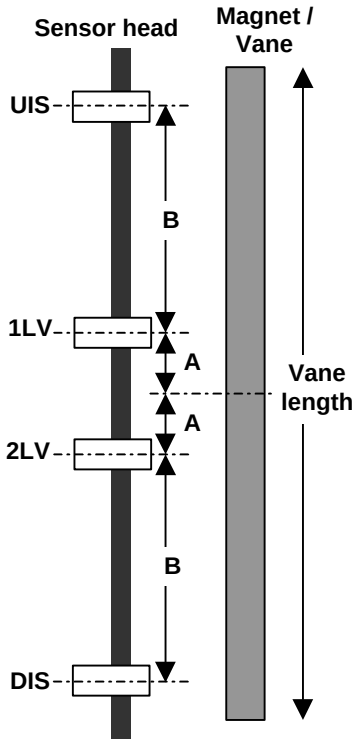
6. If a higher than nominal deceleration is desired, then increase the deceleration rate. A new learn run is not required.
7. If a lower than nominal deceleration is desired, then decrease the deceleration rate. Note however, the drive may log the error 528 Profile Err in the event log indicating LS is not long enough for the selected deceleration rate.

## 4.8 PRS

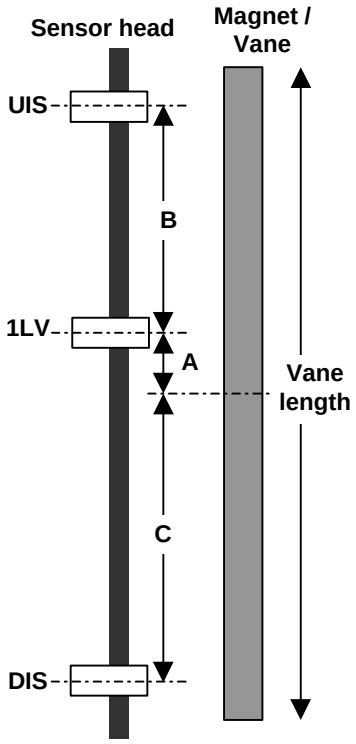
If the drive is being used with a GECB/TCBC-type controller (see parameter Interface Type), then a PRS has to be mounted, corresponding to a configuration from the table below. The magnets/vanes have to be located at the same level in each landing (relative to the hoistway door sill).

At shorter landings, the distance between door zones (= DZ magnet/vane edge-to-edge) must be at least 180 mm where the car is supposed to reach normal speed (>1.6m/s)., otherwise the door zones can not be separated with normal speed. In low-speed zones (e.g. end of hoistway), minimum gaps between DZ magnets must be guaranteed according to the table below.

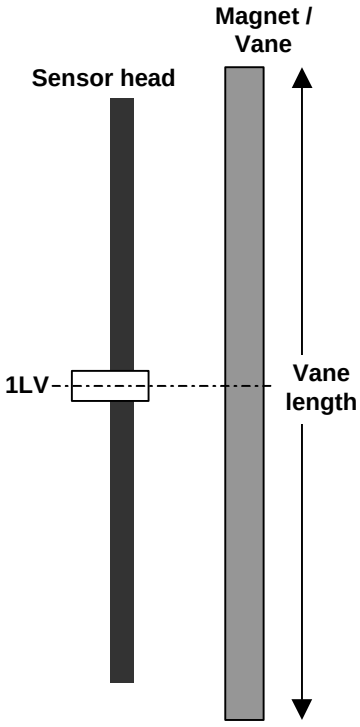
**Configuration #4:**




**Configuration #3:**




**Configuration #1:**




*The sensor heads are shown in the position where the car is level with the hoistway sill*

| Vane Sensor Type [1]) | PRS Name | Config # | Vane length [mm] | Minimum vane gap[2]) [mm] | A, B, C[3]) [mm] | Tolerance [8]) [mm] | Output logic [4]) |
|---|---|---|---|---|---|---|---|
| **0** | **PRS2 with ADO/RLEV** | 4 | 250 | 130 | A=15<br>B=100 | 15 | N.O. |
| **1** | **PRS2 w/o ADO/RLEV** | 3 | 250 | 160 | A=15<br>B=100<br>C=115 | 15 | N.O. |
| **2** | **PRS2, 1Sens, 250mm** | 1 | 250 | 50 | - | 15 | N.O. |
| **3** | **RPD-P2, 1Sens, 250mm** | 1 | 250 | 50 | - | 15 | **N.C.** |
| **4** | **CEDES Photo, 1Sens, 150mm** | 1 | **150** | 50 | - | 15 | N.O. |
| **5** | **CEDES Photo, 4Sens, 250mm** | 4 | 250 | 130 | A=15<br>B=100 | 15 | N.O. |
| **6** | **RPD-P3** | 4 | 250 | 130 | A=15<br>B=100 | 15 | N.O. |
| **7** | **PRS5** | 1 | **170** | 50 | - | 30 | N.O. |
| **8** | **PRSxx, 1Sens, 130mm** | 1 | **130** | 50 | - | 30 | N.O. |
| **9** | **PRS2 1LV+2LV, no RLEV** | 2 [6]) | **250** | 60 | A=15 | 15 | N.O. |
| **10** | **RPD-P7A, 4Sens, 150mm** | 4 | **150** | 80 | A=15<br>B=50 | 15 | N.O. |
| **11** | **RPD-P8A, 4Sens, 180mm** | 4 | **180** | 95 | A=15<br>B=65 | 15 | N.O. |
| **12** | **PRS8N, 4Sens, 170mm** | 4 | **170** [180] [7]) | 92 | A=15<br>B=62 | 15 | N.O. |
| **15** | **PRS8N, 1Sens, 170mm** | 1 | **170** [180] [7]) | 50 | - | 30 | N.O. |
| **99** | **Custom PRS**[5]) | custom [5]) | custom [5]) | Max sensor interval + 30 | - | 80 | custom [5]) |

Notes:

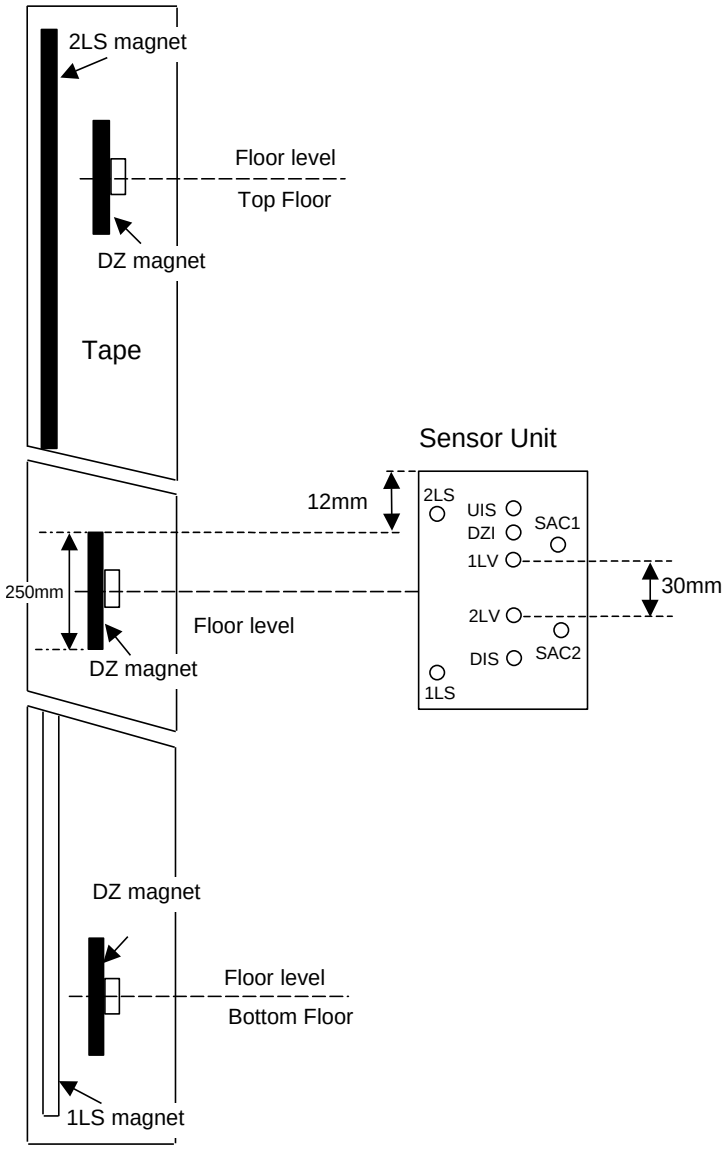
1) See SVT Contract Parameter “Vane Sensor Type”.
2) Measured between upper edge of one vane to lower edge of next vane, value includes ~20mm margin to minimum threshold checked at Learn Run.
3) A, B, C: See corresponding Configuration # in diagram above..
4) N.O. = “Normally Open”: If sensor on vane => PRS output closed = ca.+24V.
   N.C. = “Normally Closed”: If sensor on vane => PRS output open = high impedance or ca. 0V.
5) For “Vane Sensor Type”=99, a PRS configuration can be customized with individual parameters, see 6.7.2. When entering “Vane Sensor Type”=99, the custom configuration is initialized to copy the previously selected standard PRS configuration (0...8).
6) Configuration with 2 sensors: 1LV is A mm above center, 2LV is A mm below center.
7) Expectation of perceived vane (=field) length differs from geometric vane length given.
8) Learn run fails if adjacent sensor transitions deviate from nominal by more than tolerance mm.

The **minimum distance between landings is** = Minimum vane gap [mm] + Vane length [mm].
Examples:

for Vane Sensor type = 0: Min. distance = 130mm + 250mm = 380mm.
for Vane Sensor type = 7: Min. distance = 50mm + 170mm = 220mm.

The **maximum distance between landings is 12m** ! If the required distance between landings is larger, dummy vanes need to be inserted.

### 4.8.1 Example PRS configuration: PRS2



## 4.9 Learn run

If the drive is being used with TCBC-type controller (see parameter Interface Type), then the learn run has to be performed before the first normal run. The learn run must be repeated if a door zone magnet was moved. Before starting the learn run, the parameters Number of DZ, Bottom DZ, and DZ in 1LS have to be set correctly, as well as Car Dir 0/1 and Motor Phase 0/1 (see Section 4.5).

NOTE: In CAN systems with GECB software >= GAA30780DAD, the learn run may already be included in the automatic system installation routines (no extra Learn Run from SVT necessary).

The learn run can be started from anywhere in the hoistway. If the car is positioned in a door zone within 1LS, the drive assumes this is the bottom landing and starts the learn run from there. Otherwise, it performs a "find bottom landing" run before the learn run.

In the "find bottom landing" run, the car is automatically moved up out of 1LS (0.2m/s) if it was positioned in 1LS. When outside of 1LS, it is moved down with 0.5m/s until it enters 1LS. Then it is moved down with 0.2m/s counting landing vanes (starting from parameter "DZ in 1LS") until it enters the vane of landing 0. There it stops, ready for a learn run.

For the learn run, the car runs up from the lowest LV to the highest LV zone with 0.2 m/s within the 1LS and 2LS and with 0.4m/s between the LS. The drive stores the center position of each LV zones and the length of all LV zones. The center of the lowest LV zone is set to the position of 10.000m.

The learn run menu can be left during an ongoing learn run via the <MODULE>, <FUNCTION> or <SET> keys on the SVT in order to visit other SVT menus in the drive or in other components of the elevator, the learn run continues. At the end of the learn run, the learn run menu must be entered again to acknowledge the result. Also, after the completion of the "find bottom landing" run preceding a learn run, the start of the learn run must be acknowledged in the learn run menu (opportunity to verify visually that the car is in fact in the bottom landing).

*Notes regarding parameter "DZ in 1LS":*

- *A landing is counted as "in 1LS" if any one of the PRS sensors (even UIS alone) is on the landing vane while the LS sensor is on the 1LS vane.*
- *When the parameter is set to a value **smaller** than the correct value, the "find bottom landing" run will end in a landing above the bottom. A subsequent learn run would then run the car into the final limit switch 8LS.*
- *When the parameter is set to a value **greater** than the correct value, the "find bottom landing" run will run the car into the final limit switch 7LS.*
- *=> WHEN IN DOUBT, the smaller value could be chosen and then be increased in case the "find bottom landing" run ends above the bottom landing.*

*Note: The Learn Run uses the compensation mechanism for mm-position error effects as configured by parameters "*`Custom HwCmp 0/1`*" (SVT menu* 3-2 ADJUSTMENT*).*

### 4.9.1 Procedure

1. To avoid trouble with passengers, switch off the door operator (e.g. by DDO) and disable hall calls (e.g. by CHCS).
2. Optionally: Move the car to the bottom landing via ERO (into LV zone).
3. The learn run is started in SVT menu ”Learn 4-1”:


**SWITCH TO NORMAL**
**<SET> aborts!**

must be closed to proceed.

Safety chain detected OPEN,

**LEARN RUN Start**
**<SET> aborts! >**

Press <GO ON> on the SVT.

**Num of Ldgs: 007**
**CORRECT? Y=1/n=0**

landings (e.g. 7) is correct.

Press “1” if the indicated number of

Press “0” to exit the learn run

and correct the parameter.

**Ldgs in 1LS: 001**
**CORRECT? Y=1/n=0**

landings in 1LS is correct.

Press “1” if the indicated number of

Press “0” to exit the learn run

and correct the parameter.

**Calibrate Hitch**
**LoadW? Y=1/n=0**

**Visible only when Load Weigh Type = 2:**

Press “1” if hitch load weighing should be calibrated.

Press “0” if hitch load weighing calibration should be maintained.

**Switch to ERO**

Switch on ”ERO” on ERO-Box

**To start learn-**
**run press ENTER**

or

**FIND BOTTOM LNDG**
**RUN: press ENTER**

Press <ENTER> on Service Tool

**Switch back to**
**NORMAL**

Switch back to ”NORMAL” on ERO-Box.

*IF the car is inside 1LS but outside of a door zone:*

**Find Bottom Landing Run**

**FIND BOTTOM LDG,**
**moving up: --**

The car moves up, the "–" changes to "DZ" whenever the car is in a door zone.

*IF the car is outside 1LS:*

**FIND BOTTOM LDG,**
**moving down: --**

The car moves down, the "–" changes to the landing number after the first vane is encountered in 1LS.

**BOTTM LDG: start**
**learn? Y=1/n=0**

The car has reached the bottom landing according to the parameter "Landings in 1LS".

*IF the car is inside 1LS and inside of a door zone:*

**Learn Run**

**Learn active**
**CAR MOVES UP**

The car starts moving up.

**L001 21065.9mm**
**Vane 249.8mm**

While moving up, the SVT display shows the last learned data:

Landing number (bottom = 0) and position.

Vane length at this landing.

**TABLE STORED IN**
**E2PROM >**

Learn run was successful, new landing table has been stored.

Press <GOON> on the SVT to go to NORMAL operation.

**HITCH LOADW CALI**
**DONE >**

**Visible only when Load Weigh Type = 2 and HitchLw calibration was confirmed before:**

Calibration was successful, new values have been stored.
Otherwise: "FAILED " is displayed and the old values are maintained.
Press <GOON> on the SVT to go to NORMAL operation.

**LEARN RUN 4-1**
**<>**

### 4.9.2 Faults during Learn Run

When a fault is detected during the learn run, a corresponding message is displayed. After pressing <GOON>, the learn run is then aborted.

| Fault display | Description |
|---|---|
| Drive NOT in CAN mode => abort > | The setup parameter Interface Type is not correct, should be a CAN controller. |
| DRIVE NOT READY <SET> aborts! > | The drive is not yet ready to run. If this display appears for more than 1s the drive may be blocked by a fault. |
| No LS signals => abort > | The CAN connection to the drive has been interrupted, no LS signal information has been received for >2s. |
| RUN IN PROGRESS => abort > | Learn Run start is attempted while car is running. |
| SIG NOISE/BOUNCE => abort > | Noise or excessive bouncing in hoistway signals (1/2LV, UIS, DIS). |
| PRS_SIG != 1VANE => abort > | PRS sensors are on two vanes or on no vane when the actual learn run motion is about to start. |
| TRANSITN OVERDUE => abort > | Sensor transition on/off the vane does not occur when expected. |
| DETECTED ## LDGs in 1LS: abort > | When car leaves 1LS, the number ## of encountered landings does not match the setup parameter or the number of encountered landings exceeds the setup parameter in 1LS. |
| ### LDGs before 2LS: abort > | According to the setup parameter, the top landing (###-) was reached before 2LS. |
| INVAL PRS SIGNAL COMBI => abort > | Pattern of active and inactive PRS sensors is not possible on 1 or 2 vane with the selected Vane Sensor Type. |
| 1LS: ON->OFF->ON gap => abort > | After leaving 1LS, the 1LS signal became active again => Gap in 1LS magnet/vane or bouncing in 1LS signal. |
| 2LS OFF->ON->OFF gap => abort > | After entering 2LS, the 2LS signal became inactive again => Gap in 2LS magnet/vane or bouncing in 2LS signal. |
| 1LS/2LS OVERLAP! => abort > | 1LS and 2LS inputs are active at the same time. |
| VANE GAP SHORT: xxxxmm! Abort > | The gap between two vanes of xxxx mm is too short for the selected Vane Sensor Type. |
| LR ABORTED! See fault log > | The Learn Run was aborted by a non learn run error. Look in the event log for detailed information. |
| LR ABORTED by ERO/TCI! > | The Learn Run was aborted by switching to ERO or TCI. |

### 4.9.3 Find Bottom Landing Run

The Find Bottom Landing run can be started via SVT menu 4-3 from any position in the hoistway. It positions the car in the bottom landing, e.g. for starting a subsequent door check sequence run (required by controller in CAN mode at installation time). In order to allow this run to establish valid position, a successful learn run must have been executed before.

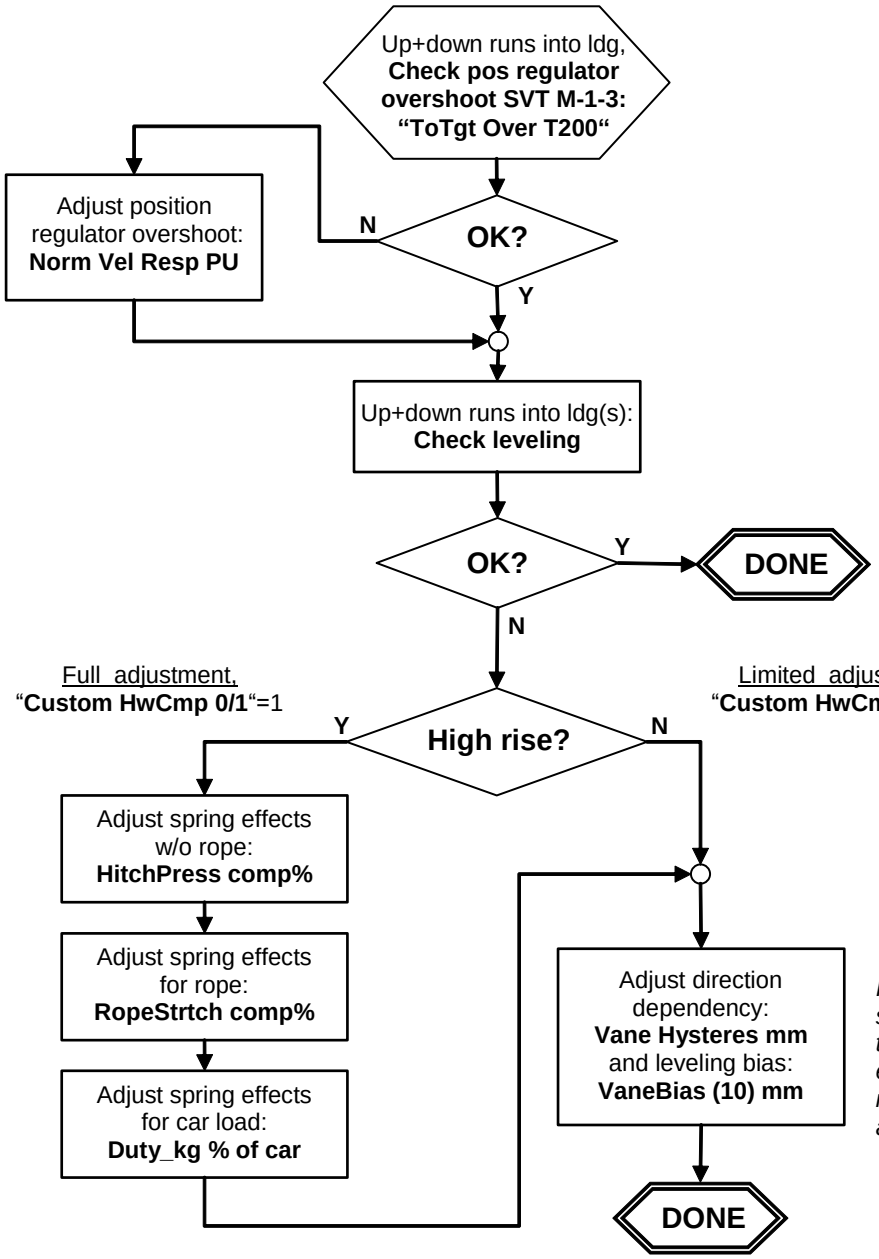
The user interaction during the Find Bottom Landing run and the preceding Start Dialog is described above (see 0)

### 4.9.4 Viewing the Landing Table

The landing table can be viewed in SVT menu 4-2. It shows each landing position and the learned vane length at each landing. The first landing is arbitrarily set to 10,000 mm. The display will look as shown below:

## 4.10 Floor Level Adjustment

If the drive is being used with TCBC/GECB-type controller (see parameter Interface Type), then the landing performance can be adjusted in the drive.




*If the magnets are adjusted in the same manner at each landing, the car should stop correctly in each landing. Otherwise the magnets/vanes should be adjusted accordingly.*

## 4.10.1 Adjustment of Position Regulator Overshoot

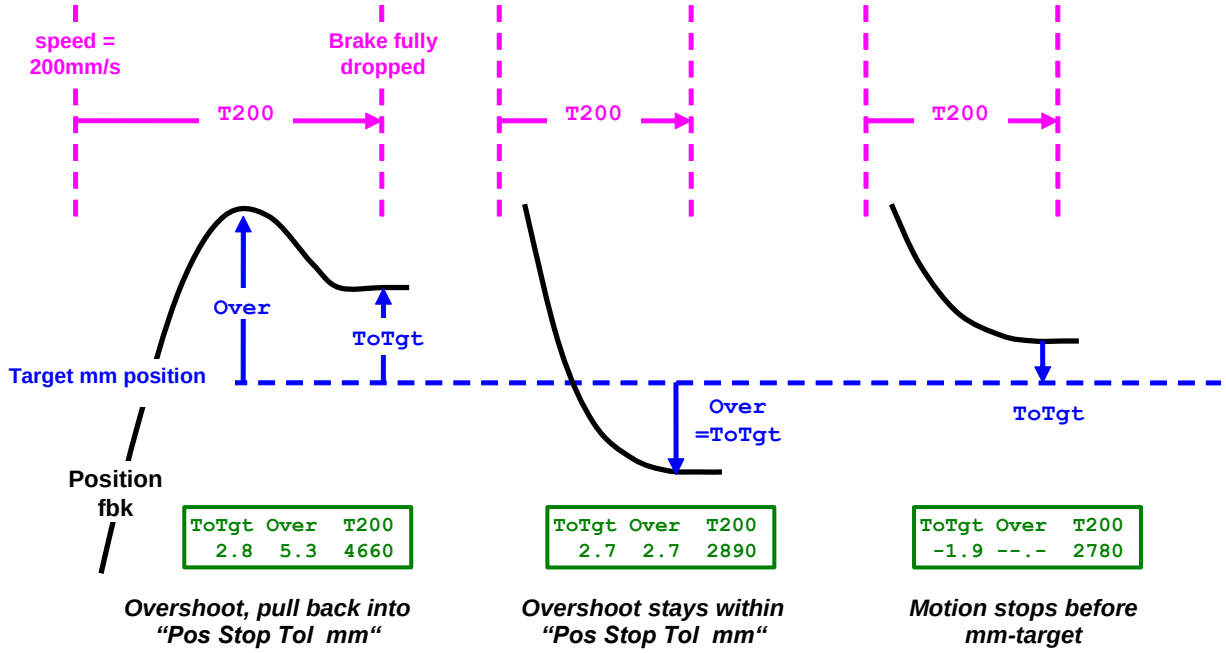
In order to arrive exactly at the target mm-position after a run of sometimes many thousand mms, the drive's regulators need to be set up correctly. Deviations of e.g. the unit's real inertia, friction or motor parameters from their assumed values can lead to undesired end-of-run behavior.

Examples:

- The run goes too far (position overshoot), turns around and slowly creeps back into the final stop
- Or the run overshoots as above but is not able to creep back into the **Pos Stop Tol mm** target region -> **`506 Stopping Err`**
- Or the run stops too soon, then needs to creep forward again.

Such effects can be felt riding the car, or noticed in the event log. Detailed and quantitative assessment is possible via the SVT M-1-3 menu "`ToTgt Over T200`". This menu displays the extent of the overshoot (=Over), the deviation of the final position (brake dropped) from the target (=ToTgt) and the time that the motion takes from speed=200mm/s to "brake dropped".

Examples for SVT M-1-3 menu "`ToTgt Over T200`":




**`Over`** = max overshoot (always positive) [mm]
**`ToTgt`** = dist to tgt (positive if tgt is overshot) [mm]
**`T200`** = time [ms] needed for end of run, starting at speed =200mm/s

Pre-conditions for adjustment of the regulator:

- The **Inertia kg-m2** has been set to the correct value. Later changes of this parameter would potentially require new regulator adjustment. The same applies to motor parameters.
- Load Weighing is enabled and adjusted.
- A Learn Run has been performed, unit is in NORMAL operation.
- The profile has been set to its final setup: Nom Speed, Accel, Decel, Jerk, Creep Speed, Creep Length, Creep jerk..
- Empty car.
- The following parameters values are set to support the **Norm Vel Resp PU** adjustment:
  M-3-2: **VaneBias (10) mm** = 10
  M-3-2: **Vane Hysteres mm** = ->contract setup
  M-3-2: **Custom HwCmp 0/1** = 0
  M-3-5: **Zero Vel Tim ms** = 0

**Adjust Norm Vel Resp PU parameter to minimize regulator overshoot**

#1) Set **Norm Vel Resp PU** to the contract setup value (typically 1.0 or 0.7).

#2) Perform 1 run each between the following landings:
  top -> top-1
  top-2 -> top-1
  bottom+2 -> bottom+1
  bottom -> bottom+1
  After each run, record the **ToTgt/Over** and the **T200** values
  (->SVT M-1-3 "ToTgt Over T200").
  Note: For **ToTgt/Over** use the value **Over** if it is displayed, use **ToTgt** if **Over** is not displayed (-> i.e. in case **ToTgt** is negative)

#3) Evaluate if the results of step#2 are acceptable (see note on criteria below).
  If improvement is desired, proceed with next iteration = step#4.

#4) Decrease/increase **Norm Vel Resp PU** by ~0.1 (typically within range 0.5…1.2) and repeat steps #2+#3. Typically, a decrease will reduce positive overshoot (car stops sooner) while an increase will cause the car to run further.

Note: Criteria for "acceptable" performance depend somewhat on the unit's characteristics like profile and the brake settings, as well as on the customer expectations. As an approximate reference, typical values could be:

| | **ToTgt/Over** | **T200** | Comment |
|---|---|---|---|
| **"GOOD"** | -0.5 … +1.0,<br>variation of step#2 values < 1.2 | 1500 … 3000 | T200 depends on brake settings |
| **"OK"** | -1.0 … +3.0,<br>variation of step#2 values < 2.0 | 2500 … 4000 | |
| **"NOT GOOD"** | Over > "**Pos Stop Tol mm** "<br>or/and Over > ToTgt | >4000 | T200 increased because of pull back extending run |

***High performance units (e.g. high rise) should achieve GOOD values.***

Example iteration:

| | Norm Vel Resp PU = 1.0 | | Norm Vel Resp PU = 0.9 | | Norm Vel Resp PU = 0.8 | |
|---|---|---|---|---|---|---|
| | **Over/ToTgt** | **T200** | **Over/ToTgt** | **T200** | **Over/ToTgt** | **T200** |
| top->top-1 | 1,8 | 2620 | 0,1 | 2720 | -0,8 | 2850 |
| top-1->bot | 2,5 | 2620 | 0,8 | 2700 | -0,3 | 2950 |
| bot->bot+1 | 1,8 | 2570 | 0,2 | 2600 | -1,0 | 2880 |
| bot+1->top | 1,6 | 2640 | -0,2 | 2760 | -0,9 | 2970 |

**Selected Norm Vel Resp PU = 0.9**

## 4.10.2 Adjustment of spring effects w/o rope via "HitchPress comp%"

This adjustment procedure measures offsets (car sill - ldg sill) in landing **top-1** and brings the sill offsets to the same value for runs in UP and DOWN direction.

*Note: It is not the goal of this adjustment to bring the sill offsets to zero, just to match them in both directions!*

**This procedure requires a suitable gage** (=measurement tool) to measure car sill versus landing sill offsets with an **accuracy of at least ~0.5mm**.

Pre-conditions for adjustment of "**HitchPress comp%**":

- Inertia and profile parameters (M-3-5) are set to final values, Load Weighing is enabled, Learn Run was performed, as in 4.10.1.
- **Norm Vel Resp PU** is adjusted (see 4.10.1).
- The **Vane Hysteres mm** value is set to represent the PRS (=RPD) sensor's hysteresis, only, as pre-set in the contract setup or determined by separate measurements.
- M-3-2: **VaneBias (10) mm** = ->not changed within this adjustment procedure.
  M-3-2: **Custom HwCmp 0/1** = 1
  M-3-2: **RopeStrtch comp%** = 100
  M-3-2: **HitchPress comp%** = 100
  M-3-2: **Duty_kg % of car** = 50
  M-3-5: **Zero Vel Tim ms** = ->contract setup
- Empty car.

**Adjustment procedure for** "**HitchPress comp%**":

#1) Measure the sill offsets for two DOWN runs **top** -> **top-1**.
If the results vary by >0.3mm, make more runs to establish a reliable average.

#2) Measure the sill offsets for two UP runs **top-2** -> **top-1**.
If the results vary by >0.3mm, make more runs to establish a reliable average.

#3) Measure the sill offsets for two long UP runs **top-4** (or -5 etc.) -> **top-1**.
If the results vary by >0.3mm, make more runs to establish a reliable average.

#4) Calculate the average from step (#2) and (#3).

#5) IF the average offset upwards (#4) is higher (>) than downwards (#1), decrement the "**HitchPress comp%**" parameter.
IF the average offset upwards (#4) is lower (<) than downwards (#1), increment the "**HitchPress comp%**" parameter.
Rough guideline: Adjust by ~5% per 0.1mm difference.

#6) Repeat steps (#1)-(#5) until the deviation between both directions is < 0.5mm.

Example (selects value 240%):

**HitchPress comp% =**

| 100% DOWN | | 100% UP | | 170% DOWN | | 170% UP | | 240% DOWN | | 240% UP | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ldg->ldg | **offset** | ldg->ldg | **offset** | ldg->ldg | **offset** | ldg->ldg | **offset** | ldg->ldg | **offset** | ldg->ldg | **offset** |
| 15->14 | +0,6 | 13->14 | -0,5 | 15->14 | +0,3 | 13->14 | -0,2 | 15->14 | 0,0 | 13->14 | -0,1 |
| 15->14 | +0,7 | 13->14 | -0,6 | 15->14 | +0,5 | 13->14 | -0,2 | 15->14 | -0,1 | 13->14 | 0,0 |
| | | 7->14 | -0,8 | | | 7->14 | -0,3 | | | 7->14 | -0,1 |
| | | 7->14 | -0,8 | | | 7->14 | -0,4 | | | 7->14 | +0,3 |
| **Avg=** | **+0,7** | | **-0,7** | | **+0,4** | | **-0,3** | | **-0,1** | | **+0,0** |

*Note: Negative offset means car sill is below landing sill!*

## 4.10.3 Adjustment of spring effects for rope via "RopeStrtch comp%"

Analog to 4.10.2 Adjustment of spring effects w/o rope via "HitchPress comp%", this adjustment procedure measures offsets (car sill - ldg sill) in landing **bottom+1** and brings the sill offsets to the same value for runs in UP and DOWN direction.

Pre-conditions for adjustment of "**RopeStrtch comp%**":

As at the end of 4.10.2 Adjustment of spring effects w/o rope via "HitchPress comp%".

**Adjustment procedure for "RopeStrtch comp%":**

#1) Measure the sill offsets for two UP runs **bottom** -> **bottom+1**.
If the results vary by >0.4mm, make more runs to establish a reliable average.

#2) Measure the sill offsets for two DOWN runs **bottom+2** -> **bottom+1**.
If the results vary by >0.4mm, make more runs to establish a reliable average.

#3) Measure the sill offsets for two long DOWN runs **bottom+4** (or +5 etc.) -> **bottom+1**.
If the results vary by >0.4mm, make more runs to establish a reliable average.

#4) Calculate the average from step (#2) and (#3).

#5) IF the average offset downwards (#4) is higher (>) than upwards (#1), increment the "**RopeStrtch comp%**" parameter.
IF the average offset downwards (#4) is lower (<) than upwards (#1), decrement the "**RopeStrtch comp%**" parameter.
Rough guideline: For a 100m rise from bot(+1) to top(-1), adjust by ~15% per 1mm difference.
For other rises: Proportional to rise, higher rises -> smaller corrections per mm deviation.

#6) Repeat steps (#1)-(#5) until the deviation between both directions is < 0.6mm.

Example (selects value 60%):

**RopeStrtch comp% =**

| 100% DOWN | | 100% UP | | 70% DOWN | | 70% UP | | 60% DOWN | | 60% UP | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ldg->ldg | **offset** | ldg->ldg | **offset** | ldg->ldg | **offset** | ldg->ldg | **offset** | ldg->ldg | **offset** | ldg->ldg | **offset** |
| 2->1 | -2,3 | 0->1 | 0,0 | 2->1 | -1,9 | 0->1 | -1,1 | 2->1 | -1,5 | 0->1 | -0,7 |
| 2->1 | -2,1 | 0->1 | 0,0 | 2->1 | -1,6 | 0->1 | -0,9 | 2->1 | -1,2 | 0->1 | -1,6 |
| 7->1 | -1,4 | | | 7->1 | -1,6 | | | 7->1 | -0,6 | 0->1 | -1,1 |
| 7->1 | -1,8 | | | 7->1 | -1,5 | | | 7->1 | -0,7 | | |
| **Avg=** | **-1,9** | | **0,0** | | **-1,7** | | **-1,0** | | **-1,0** | | **-1,1** |

*Note1: Negative offset means car sill is below landing sill!*

*Note2: Landings #4-#6 were not available for starts (dummies), or deemed too close for a "long run".*

## 4.10.4 Adjustment of spring effects for car load via "Duty_kg % of car"

Analog to 4.10.3 Adjustment of spring effects for rope via "RopeStrtch comp%", this adjustment procedure measures offsets (car sill - ldg sill) in landing bottom+1 with **~full load** in the car and brings the sill offsets to the same value for runs in UP and DOWN direction.

Pre-conditions for adjustment of "**Duty_kg % of car**":

As at the end of 4.10.3 Adjustment of spring effects for rope via "RopeStrtch comp%" but car is loaded to approximately full load (80% - 100%).

**Adjustment procedure for "Duty_kg % of car":**

#1) Measure the sill offsets for two UP runs **bottom** -> **bottom+1**.
If the results vary by >0.4mm, make more runs to establish a reliable average.

#2) Measure the sill offsets for two DOWN runs **bottom+2** -> **bottom+1**.
If the results vary by >0.4mm, make more runs to establish a reliable average.

#3) Measure the sill offsets for two long DOWN runs **bottom+4** (or +5 etc.) -> **bottom+1**.
If the results vary by >0.4mm, make more runs to establish a reliable average.

#4) Calculate the average from step (#2) and (#3).

#5) IF the average offset downwards (#4) is higher (>) than upwards (#1), increment the "**Duty_kg % of car**" parameter.
IF the average offset downwards (#4) is lower (<) than upwards (#1), decrement the "**Duty_kg % of car**" parameter.
Rough guideline: Start with 10% step, then asses the effect (reduction of gap between position in UP and DOWN dir). Scale next step accordingly..

#6) Repeat steps (#1)-(#5) until
A) the deviation between both directions is < 0.6mm or
B) the "**Duty_kg % of car**" is >100% or <25%.

Example (selects value 25%):

**Duty_kg % of car:**

| **50%** DOWN | | **50%** UP | | **40%** DOWN | | **40%** UP | | **30%** DOWN | | **30%** UP | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ldg->ldg | **offset** | ldg->ldg | **offset** | ldg->ldg | **offset** | ldg->ldg | **offset** | ldg->ldg | **offset** | ldg->ldg | **offset** |
| 2->1 | -3,0 | 0->1 | -1,3 | 2->1 | -2,6 | 0->1 | -2,1 | 2->1 | -2,3 | 0->1 | -1,4 |
| 2->1 | -3,1 | 0->1 | -1,3 | 2->1 | -2,5 | 0->1 | -1,7 | 2->1 | -2,3 | 0->1 | -1,6 |
| 7->1 | -2,8 | | | 7->1 | -2,8 | | | 7->1 | -2,3 | | |
| 7->1 | | | | 7->1 | | | | 7->1 | | | |
| **Avg=** | **-3,0** | | **-1,3** | | **-2,6** | | **-1,9** | | **-2,3** | | **-1,5** |

| **25%** DOWN | | **25%** UP | |
|---|---|---|---|
| ldg->ldg | **offset** | ldg->ldg | **offset** |
| 2->1 | -2,1 | 0->1 | -1,6 |
| 2->1 | -2,3 | 0->1 | -1,4 |
| 7->1 | -1,8 | | |
| 7->1 | -2,1 | | |
| | **-2,1** | | **-1,5** |

*Note1: Negative offset means car sill is below landing sill!*

*Note2: The last run 7->1 was omitted where the average was consistent enough to go to he next iteration.*

## 4.10.5 Adjustment of direction dependency via "Vane Hysteres mm" and of leveling bias via "VaneBias (10) mm"

**This procedure requires a suitable gage** (=measurement tool) to measure car sill versus landing sill offsets with an accuracy of **at least ~0.5mm**.

*The leveling error measurements cited in this document are positive (e.g. +2.5mm) if the car sill is above the landing sill, negative (e.g. -1.5mm) if the car sill is below the landing sill.*

Adjustment procedure:

#1) Set **Vane Hysteres mm** to the contract value.
If the adjustment steps 4.10.2 - 4.10.4 have been performed, use the settings selected in those steps.

#2) Perform runs up and down into several (minimum=1, best=all) landings:
After each run, record the leveling error of car sill versus landing sill.
*If the adjustment steps 4.10.2-4.10.4 have been performed, the levelling data of the final adjustment in each step (average per direction) can be re-used here*.

#3) Calculate the average leveling error in UP direction (err_up) over all measured landings and the average in DOWN direction (err_dn).

#4) Increment the **Vane Hysteres mm** by half the difference: **(err_up – err_dn) / 2**.
Decrement the **VaneBias (10) mm** by the mean: **(err_up + err_dn) / 2**

#5) Perform test runs to verify the new settings: The difference between the averages in UP and DOWN direction should be smaller.

Example:

| | |
|---|---|
| Vane Hysteres mm | **1,0** |
| VaneBias (10) mm | **10,0** |

**Add (3,0 - - 0,2) /2 = 1,6 ->**
**Subtract (3,0 + - 0,2) /2 =1,4 ->**

| | |
|---|---|
| **2,6** | |
| **8,6** | |

**Levelling error "car sill - ldg sill" [mm]**

| | UP | DOWN |
|---|---|---|
| Landing 0: | | 0,0 |
| Landing 1: | +3,0 | +0,5 |
| Landing 2: | +3,0 | 0,0 |
| Landing 3: | +2,5 | -1,0 |
| Landing 4: | +3,5 | -0,5 |
| Landing 5: | +3,0 | |
| **average:** | **3,0** | **-0,2** |

***VERIFY NEW SETTING ->***

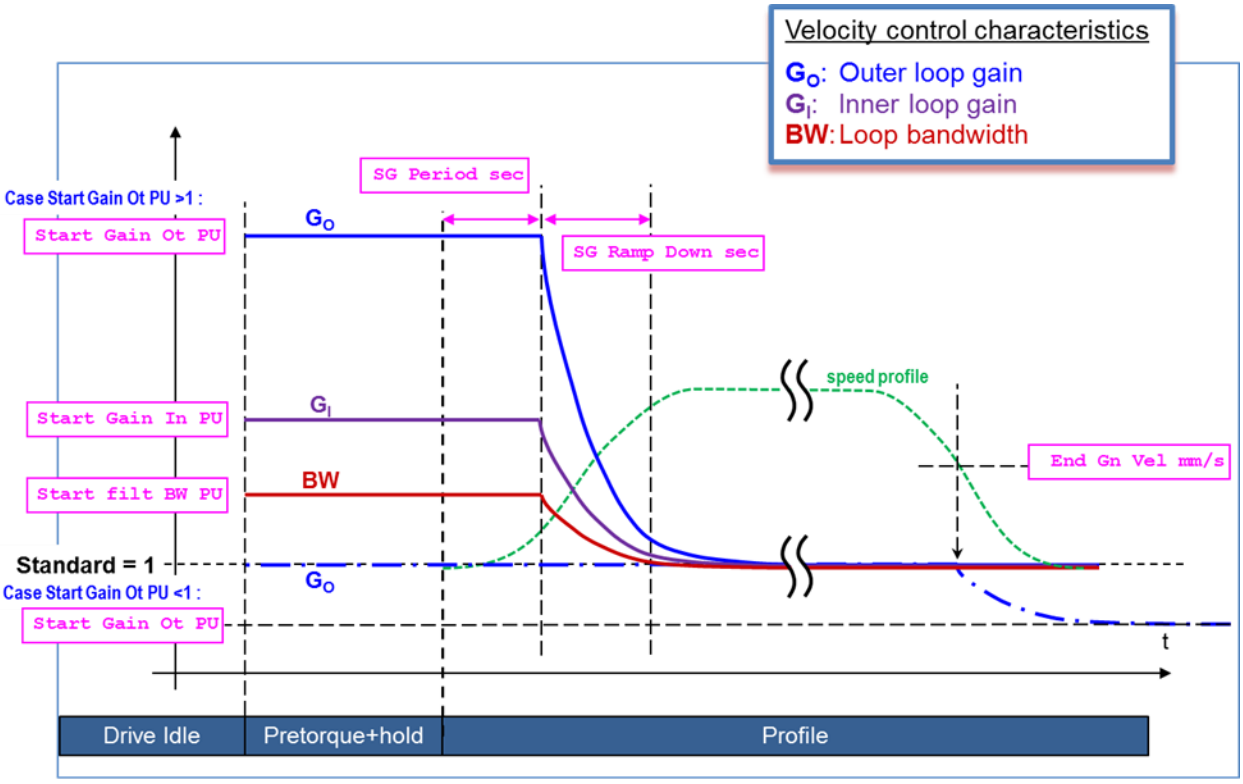
| UP | DOWN |
|---|---|
| | +0,2 |
| 0,0 | +0,7 |
| 0,0 | +0,2 |
| -0,5 | -0,8 |
| +0,5 | -0,3 |
| 0,0 | |
| **0,0** | **0,0** |

***Idealized example, reality will include random variation !!***

## 4.11 Start Jerk / Rollback Reduction

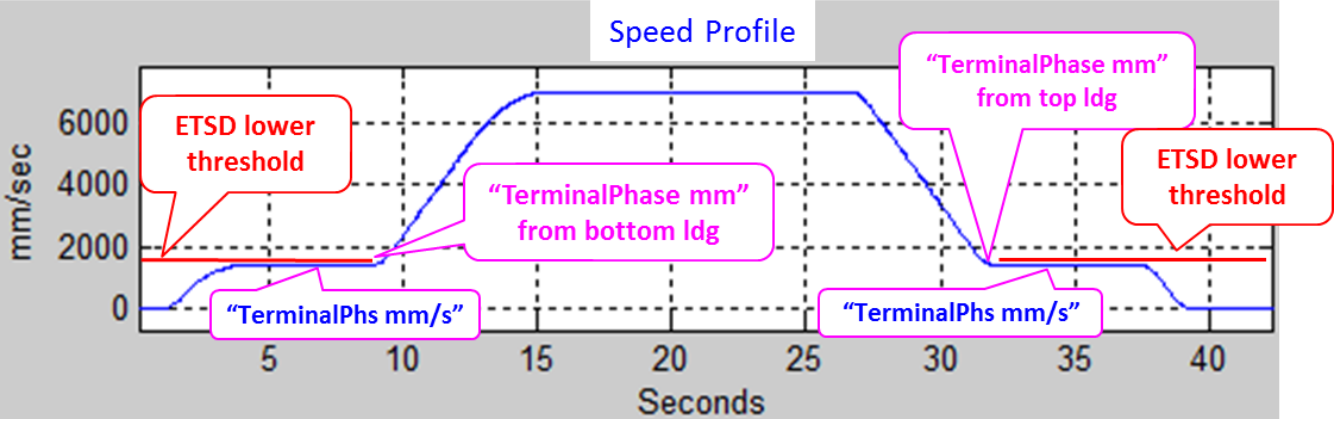
If discrete load weighing is being used, start jerk can be reduced by adjusting the parameters `Start Gain Ot PU`, Start filt BW PU, Start Gain In PU in menu **3-2 ADJUSTMENT**. Increase the parameter until either the start jerk is acceptable or the machine starts to produce noise at the start of the run. This parameter has two associated parameters SG Period sec and SG Ramp Down sec to control the duration of the bandwidth velocity control and the rate at which the nominal bandwidth is resumed respectively. Please see the figure below. A further reduction of the start jerk is possible by upgrading to an analog load-weighing device.

*Note: Acceptable start jerk performance may not be acceptable for any settings of the start gain parameters when using an incremental encoder in a gearless system with discrete loadweighing. An adapter board can be installed on the GDCB called the Communication and Encoder Interface Board (CEIB) that will work with a sine/cosine encoder to get good start jerk performance with discrete loadweighing.*



## 4.12 Reduced Terminal Speed (ETSD support)

The “Reduced Terminal Speed” feature is designed to support e.g. a low reduced stroke buffer speed that can otherwise not be supported by a 2-phase ETSD feature in combination with a high nominal speed.




**Feature set up**:

This feature can be configured via the following SVT parameters (M-3-5 PROFILE):

TerminalPhase mm: Length of reduced-speed zone before the terminal landing.
TerminalPhs mm/s: Speed limit in reduced-speed zone before the terminal landing.

***Setting*** TerminalPhase mm ***to zero disables the “reduced terminal speed” feature and hides the parameter “***`TerminalPhs mm/s`***”!***

**Feature characteristics**:

1. Normal runs with exactly known position will be performed such that only the parts inside the reduced-speed zones run at reduced profile.
2. Normal runs with inaccurately known position will stay at reduced speed as long as position is inaccurate and they are in 1/2LS.
3. All other run types (CORR, RESC, INS, LEARN) will be limited to reduced speed inside the LS or when LS signals are compromised, not limited outside known LS (regardless of position being valid/accurate). With reduced ETSD speeds of >= 0.5m/s, this will only affect CORR runs, all other runs are limited to <=0.5m/s anyway.

**Feature limitations/constraints:**

1. A regular creep profile is not executed in target landings where reduced-speed profile is active.
2. Parameter "Creep Jerk 0/1" must be set to 1 (avoid timed decel at end of reduced profile). This is automatically set by the drive for “TerminalPhase mm” > 0.
3. For NTSD/ETSD/Buffer test, the "Reduced Terminal Speed" feature must be disabled ("TerminalPhase mm"=0), otherwise the CORR speed could be reduced in the 1/2LS during the test.
4. TerminalPhs mm/s must be at least 500mm/s below “Nom Speed mm/s” or (for Nom Speed <1m/s) half of “Nom Speed mm/s”. **Attention**: The drive software enforces this when the Nom Speed parameter is reduced (even temporarily) and does not set TerminalPhs mm/s back to its original value! Also, the drive software enforces “TerminalPhase mm” < LS length.
5. TerminalPhs mm/s must be larger than Creep Speed mm/s. **Attention**: The drive software enforces this when the Creep Speed mm/s is changed.
6. NTSD will not take effect before ETSD for reduced terminal speed zone setups – ETSD will trigger in NTSD test mode! This affects only NTSD at Nom Speed, not at CORR runs (limited to 2.0m/s).

7. Limit switches 1/2LS need to be long enough to allow deceleration from the LS edge down to reduced speed before the reduced-speed zone begins in the 3 scenarios described below.**This needs to be ensured in the field!**

Estimating additional LS length for “Reduced Terminal Speed” feature

There are three aspects in the “reduced Terminal Speed” feature that require additional length for 1/2LS. All 3 aspects intend to make sure that the reduced speed is reached when entering the reduced speed zone.

#1) A CORRECTION run needs to decelerate (profile with jerk) to the reduced speed (if that is < CORR speed 2.0m/s) from the 1/2LS.
#2) A NOR run with uncertain mm-position (max. possible speed 4m/s) needs to decelerate (profile with jerk) to the reduced speed (if that is < 4.0m/s) from the 1/2LS.
#3) A NOR run needs to fault-decelerate (in case of unexpected LS, profile without jerk) from Nominal Speed to the reduced speed from the 1/2LS.

Example Grande Arche with Nom Speed 6m/s, decel=1.0m/s$^2$, jerk=1.4m/s$^3$, reduced speed=1.4m/s, reduced speed zone=9.0m

#1) Profile decel with jerk 2.0->1.4m/s: 2.2m
Minimum total LS length required: 2.2m + 9.0m = 11.2m
#2) Profile decel with jerk 4.0->1.4m/s: 9.0m
Minimum total LS length required: 9.0m + 9.0m = 18.0m
#3) Timed decel (no jerk) 6.0->1.4m/s: 16.7-1.1m=15.6m (see OPMAN LS table!)
Minimum total LS length required: 15.6m + 9.0m = **24.6m**

While strictly speaking only 24.6m would be required, some extra margin (e.g. LS length 30m) would not hurt and could provide the degree of freedom e.g. to allow switching to a smaller decel rate of 0.8 m/s$^2$.

Note: The above values of 2.2m and 9.0m for deceleration with jerk profile have been derived from simulations. For comparison, these are the corresponding values for the timed deceleration (no jerk) that are provided in the “Minimum LS distance” table (section 4.7).

- timed decel (no jerk) 2.0->1.4m/s: 2.1-1.1m=1.0m (jerked decel 2.2m = 220%, <- small delta v)
- timed decel (no jerk) 4.0->1.4m/s: 7.6-1.1m=6.5m (jerked decel 9.0m = 138%, <- large delta v)

# 5 Self-Commissioning Operation

## 5.1 Overview

The Self-Commissioning software functions are designed to automatically measure the *induction* motor parameters and adjust the service tool parameters in the drive to achieve a properly tuned drive/motor combination, with the correct magnetizing current, rotor time constant, and inertia (note: inertia can be determined for PM motor applications as well). The benefit of self-commissioning software is that it achieves this without the need to unrope the elevator, remove the motor or employ special test equipment. The software requires four values from the motor nameplate: Rated voltage, power, rpm, and frequency. All other parameters are computed or measured by the drive to achieve correct elevator operation at the contract speed.

Self-commissioning tests are run in three stages:

- The first stage is the locked rotor tests, where the drive adjusts the current regulator and measures the motor parameters. The motor does not turn during these tests, and the brake is not lifted. This stage is required if the motor parameters are not known beforehand.
- The second stage is a fine-adjustment of the rotor time constant and magnetizing current, to ensure that the rotor time constant and magnetizing current are set to correct values for running at contract speed. The second stage requires the installer to command high speed, multi-floor runs under control of the motion subsystem. It is important that the elevator reach contract speed during these runs, and that the car be empty. To ensure consistent and accurate measurements, all runs must be between the same two landings, e.g., from bottom to top, or from floor 2 to 8, etc.
- The third stage of self-commissioning is the inertia adjustment. The operator requirements for this stage are identical to those for the second, i.e., to command multi-floor runs under control of the motion subsystem.

**THE ONLY SELF COMMISSIONING TEST THAT CAN BE PERFORMED WITH A PM SYNCHRONOUS MOTOR IS THE INERTIA TUNING!!**

If the only available data on the motor is the nameplate data, the complete set of self-commissioning tests should be run. On new equipment installations, where the motor parameters are factory-set, it is possible to run only the inertia adjustment.

The elevator runs during the second and third stage of self-commissioning may be commanded using the service tool interface to the controller. It is also possible, and may be preferable, to use the service tool to set up the controller to cycle the elevator up and down automatically. Allow for a 15 second interval between runs, and make sure that the elevator reaches full contract speed for at least 3-5 seconds during the run. The elevator controller may be set to ‘Inspection” to temporarily halt the cycling, for example when it is time to save the service tool parameters (this is further described in the step by step procedure).

The self-commissioning stages were designed to run in sequence or as standalone tests. Each stage, however, relies on certain EEPROM parameters. These parameters should be obtained either through self commissioning tests or entered into the EEPROM by the installer. For example, the Fine-Tuning stage requires ($L\sigma$), also known as the motor transient inductance, in service tool parameter “Mtr Lsigman mH”‘ in menu M34. This value can either be computed from locked rotor tests or, if known, entered manually by the installer. Either method is acceptable.

At the end of each self commissioning test, the user is given the opportunity to save the determined parameters to EEPROM automatically or to abort without saving. The determined parameters are available for inspection in menu M12 until the processor board is reset or the drive powered down.

NOTE 1: Do not unplug the service tool from the drive during the self-commissioning tests. The tests will abort when the SVT is reconnected, and all test data will be lost.

NOTE 2: The drive service tool CANNOT be used to view dynamic displays such as current, torque or motor voltage while the self tuning tests are in progress (see following note).

NOTE 3: To abort self-commissioning tests hit Module, Function or Set key on the service tool.

NOTE 4: The drive will NOT accept PTR from the controller while in self commissioning mode unless it specifically asked for through the service tool during fine tuning and inertia tests. You MUST exit the self commissioning mode (see section 5.4.8 below) to run the elevator in normal, inspection or manual mode.

## 5.2 EEPROM parameters

The following is a list of all the EEPROM parameters determined by self commissioning (listed by test):

| *Test* | *Menu* | *Parameters* |
|---|---|---|
| Locked Rotor | M31<br>M34 | Inertia kg-m2 (estimate)<br>Rtr Time Const s, Rated Mag I A, Peak Mag I A, Rated Trq I A, Rated Trq Nm, Mtr Lsigma mH, Ld mH, Lq mH, R Ohm. |
| Fine Tuning | M34 | Rtr Time Const s, Rated Mag I A, Peak Mag I A, Rated Trq I A, Rated Trq Nm |
| Inertia | M31 | Inertia kg-m2 |

All other EEPROM parameters, such as limit current, drive rating, pretorque trim, etc, must be set correctly as they are not self-tuned.

## 5.3 How do I do this ….

The following table is intended to help the user determine which self commissioning tests to run based on the available motor and hoistway data.

| *Situation* | *Tests to Run* | *Steps to take* |
|---|---|---|
| Modernization job, no data available except for motor nameplate data and duty data. No controller connected, only manual mode elevator operation required. | Locked Rotor | Start with section 5.4.1. Stop before section 5.4.5. |
| Modernization job, no data available except for motor nameplate data and duty data. Controller is connected and operational | Locked Rotor, Fine Tuning, Inertia | Start with section 5.4.1. Perform all self commissioning tests. |
| Have reasonable estimate of motor parameters and current regulator parameters but do not know motor Lsigma (transient inductance) | Locked Rotor, Fine Tuning, Inertia | Start with section 5.4.1. Perform all self commissioning tests. |
| Have reasonable estimate of motor parameters and current regulator parameters and have | Fine Tuning, Inertia | Enter the following SVT parameters :<br>M34 - Ld mH, Lq mH, R Ohm, Number of |

| Situation | Tests to Run | Steps to take |
|---|---|---|
| reasonable estimate of motor Lsigma (transient inductance) and inertia. | | Poles, Rtr Time Const s, Rated Mag I A, Peak Mag I A, Rated Trq I A, Rated Trq Nm, Mtr Shft Pwr kW, Rtd Mtr Spd RPM, Rtd Mtr Ln-Ln V, Rtd Mtr Freq Hz, Mtr Lsigma mH. M31- enters your best guess for inertia. Check that elevator runs in inspection or manual mode. If it does not start with section 5.4.1, else start with section 5.4.5. |
| Elevator runs ok, but require better inertia estimate | Inertia | Enter your best guess for inertia in M31. Start with section 5.4.6. |

## 5.4 Running Self-Commissioning Tests

### 5.4.1 Entering Auto Tune Mode

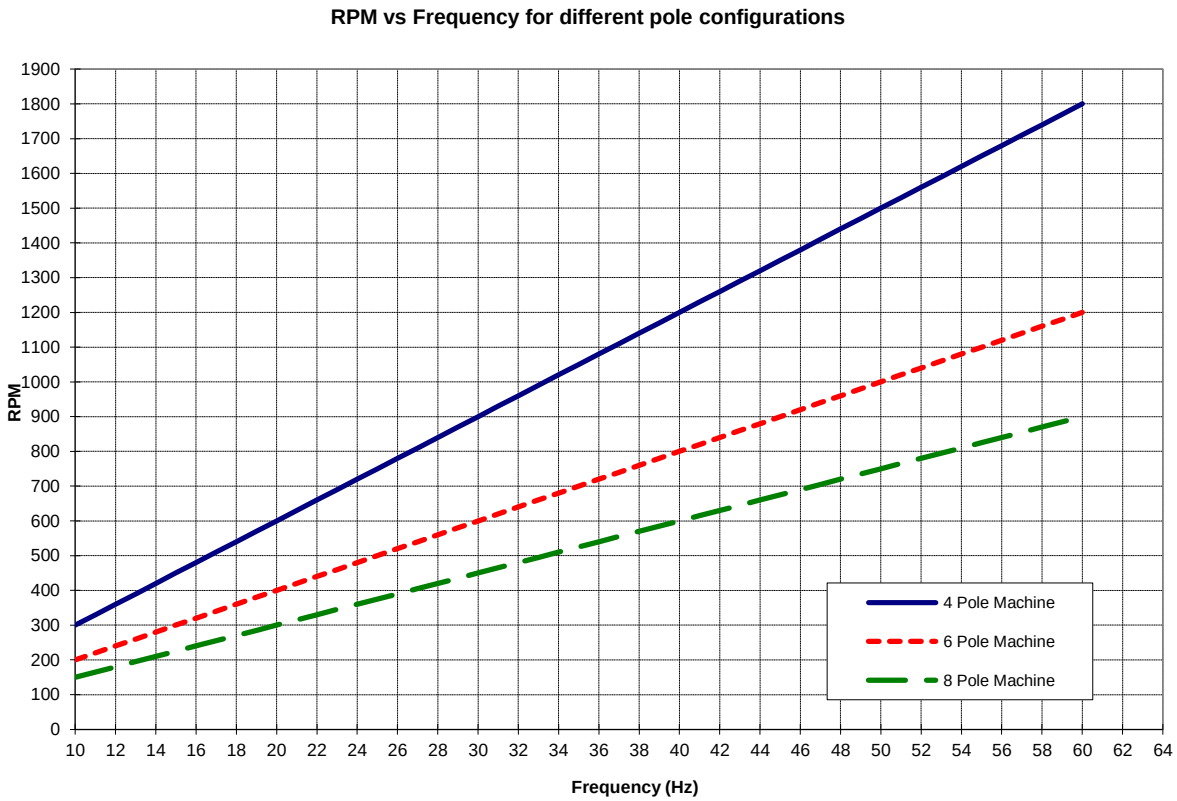
1. Use the SVT to access category M31 and hit the go-on key unti the parameter "Motor Type" is displayed. Set the parameter to 901.
2. Use the SVT to access category M31 and hit the go-on key until the parameter "Self Tune 0/1" is displayed. Set the parameter to 1.
3. Hit the go-on key to display the parameter "LR Ampl KP/Ki PU". Make sure that this parameter is set to 0.2. This parameter controls the amplitude of the test current. 0.2 corresponds to 20% of drive rated current.
4. Verify that 'Motor Nameplate Data' and 'Number of Poles' (see section 5.4.2) are entered correctly.
5. Go to section 5.4.3 to perform the 'Locked Rotor Test.'

### 5.4.2 Entering Motor Nameplate Data and Number of Poles.

1. Use the SVT to access category M34 and hit the go-on key to display the "Number of Poles" parameter. Enter the number of poles in the motor. The number of poles in a motor can be determined with the following formula :

$$number\_of\_poles = floor\left(120 * \frac{Rated\_frequency}{Rated\_RPM}\right)$$

where Rated_frequency and Rated_RPM are the **nameplate** RPM speed and frequency respectively. **If number_of_poles results in a decimal number then round the number down to the nearest even integer** (4.11 would be entered as 4). Alternatively you can use the following graph to look up the rated RPM and frequency and match it to the **closest** 'pole' line:




2. Hit the go-on key until the parameter "`Mtr Shft Pwr kW`" is displayed. Enter the rated power in kilowatts from the motor nameplate.
3. Hit the go-on key to display the "`Rtd Mtr Spd RPM`" parameter. Enter the rated speed in rpm from the motor nameplate.
4. Hit the go-on key to display the "`Rtd Mtr Ln-Ln V`" parameter. Enter the rated motor line-to-line rms voltage from the motor nameplate.
5. Hit the go-on key to display the "Rtd Mtr I Arms" parameter. If available, enter the rated motor current from the motor nameplate. If not known, leave the parameter to its default setting of zero.
6. Hit the go-on key to display the "Rtd Mtr Freq Hz" parameter. Enter the rated frequency in Hz from the motor nameplate.
7. Hit the go-on key to display the "Mtr Lsigma mH" parameter. Enter the motor transient inductance (Lsigma) if known or 0.001 if not known. The drive will determine this value during the locked rotor phase of the tests.
8. Hit the go-on until the "Low Volt Op 0/1" parameter is displayed. Enter 1 if the rated motor line to line voltage is less than or equal to 400 Vrms. Otherwise, set the parameter to zero.

**WARNING: THE PARAMETERS TO BE ENTERED ARE THE MOTOR NAMEPLATE PARAMETERS. DO NOT ENTER THE CONTRACT PARAMETERS.**

### 5.4.3 Initial Tests with Stationary Elevator (Locked Rotor Tests) – INDUCTION MOTOR ONLY!!

1. Power down the drive.
2. Establish the safety chain at the drive according to correct local practices. This may involve adding jumpers in the controller depending upon which controller is used. **Do not forget to remove these jumpers once the locked rotor tests are finished**.
3. Power on the drive.
4. After the safety chain is established, the signal “SAF” must indicate 1 in SVT menu M15 for 422-based controllers. For CAN-based controllers, both UIB and DIB must indicate 1 in SVT menu M15.
5. Use the SVT and access menu M71. To start the test, hit ‘Go-On’ on the SVT. The drive will now automatically tune the current regulators and measure the motor parameters. During the tests, the drive will display its progress on the service tool screen.
6. When the tests are finished, the SVT will display ’Lckd Rotor Tests / Complete Hit >’. Hit the go-on key to proceed.
7. The service tool will now display the data determined during the locked rotor test. To save the data to EEPROM, hit SHIFT-ENTER (this can be done at any time while vieweing the data). Otherwise hit the module, function or set keys to abort the test. If the saving operation is aborted, the determined parameters will not be saved to EEPROM but will be available for inspection in M12 (see section 5.4.7).
8. **If a jumper was required to satisfy the safety chain in Step 2, power down the drive and remove the jumper**. If you need to power the drive down to remove jumpers, first access M12 and write down the locked rotor test results as required in the data-sheet. These results will not be displayed in M12 once you cycle power to the drive (of course if you saved them to EEPROM, you can search for them in the regular service tool tree).

### 5.4.4 Checking Motor Phasing

1. After the locked rotor tests, the elevator should move in manual mode or inspection mode. Power up the drive, exit auto tune mode (see section 5.4.8) and check that the elevator runs by using manual or inspection mode.
2. If the elevator fails to move and a motor overcurrent fault is logged, check the phasing of the motor with the appropriate procedure. One such procedure is outlined in [TIP1.1.12.0-1]

## STOP HERE if you plan to run in manual mode only.

### 5.4.5 Motor Fine-Tuning Tests – INDUCTION MOTOR ONLY!!

1. If necessary, power on the drive. Ensure that the drive is in auto-tune mode *see section 5.4.1*
2. Disable hall calls, car calls and parking operations before proceeding. Also, disable doors so that passengers cannot enter the car.
3. Make sure that the four correct motor nameplate parameters are entered in M34.
4. If the locked rotor tests were not run or the parameters obtained not saved, make sure that the correct value of Lsigma (transient inductance) is entered in service tool parameter “Mtr Lsigma mH” in menu M34.
5. Before starting the test, select two floors between which you want to run. Ensure that the car is at the lower of the two floors (first requested run is up). If this is not the case, put

the drive in normal mode and move the car as necessary. Then re-enter auto tune mode (see section *5.4.1*)

6. Access menu M72, and hit 'go-on to start the test.
7. When prompted by the SVT, issue an up call through the controller. Then, When prompted by the SVT, issue a down call through the controller.

   **OR –** allow the elevator to cycle up and down while the drive collects data and adjusts the SVT parameters (cycle the elevator between the two selected floors).

   **It is required that the car reach contract speed for 3-5 seconds during these runs, and that the car be empty.**

8. The last step will repeat several times (at least 4 cycles of up and down runs). A minimum of three cycles is required to determine the rotor time constant. One additional cycle is required to check the magnetizing current and determine the magnetizing inductance. If the magnetizing current requires adjustment, the rotor time constant must be re-checked, requiring additional up/down runs.
9. When the tests are finished, the SVT will display the results of the test. Hit the go-on key to proceed. At any time the data can be saved by hitting SHIFT-ENTER.
10. To save the data to EEPROM hit SHIFT-ENTER. Otherwise hit the module, function or set keys to abort the test. If the saving operation is aborted, the determined parameters will not be saved to EEPROM but will be available for inspection in M12 (see section 5.4.7).

## START HERE to run Inertia test only

### 5.4.6 Inertia Adjustment – Induction Motor or PM Synchronous Motor
**(ONLY ACCEPTABLE TEST FOR PM SYNCHRONOUS MOTOR)**

1. If necessary, power on the drive. Ensure that the drive is in auto-tune mode *see section 5.4.1*
2. Disable hall calls, car calls and parking operations before proceeding. Also, disable doors so that passengers cannot enter the car.
3. Before starting the test, select two floors between which you want to run. Ensure that the car is at the lower of the two floors (first requested run is up). If this is not the case, put the drive in normal mode and move the car as necessary. Then re-enter auto tune mode (see section *5.4.1*)
4. Access SVT menu M73 and hit the 'go-on' key to start the test.
5. When prompted by the SVT, issue an up call through the controller. Then, when prompted by the SVT, issue a down call through the controller.

   **OR –** allow the elevator to cycle up and down while the drive collects data and adjusts the INERTIA parameter (cycle the elevator between the two selected floors).

6. Last step will repeat several times (at least 2)
7. When the tests are finished, the SVT will display 'Inertia Tuning / Complete Hit >'. Hit the go-on key to proceed.
8. The service tool will now display 'Hit Entr to Save'. To save the data to EEPROM hit SHIFT-ENTER. Otherwise hit the module, function or set keys to abort the test. If the saving operation is aborted, the determined parameter will not be saved to EEPROM but will be available for inspection in M31 (see section 5.4.7).

### 5.4.7 Parameter Display

1. Access SVT menu M12 to display parameters which were determined during the self-commissioning tests.
2. Hit go-on or go-back to move back and forth between the different display parameters. Please note that some parameters may be zero if the test has not been performed yet or if the processor board was reset between tests.

### 5.4.8 Exiting Auto Tune Mode

1. Use the SVT to access M32 and hit the go-on key until the parameter "`Self Tune 0/1`" is displayed. Set the parameter to 0.

## 5.5 Troubleshooting Notes

The following is a list of the most common problems encountered while self commissioning the drive. Please refer to this list if there is a problem.

| *Symptom* | *Possible Cause* | *Steps to take* |
|---|---|---|
| The locked rotor test will not start. | The safety chain is not established. | Repeat Step 2 in section 5.4.3. |
| Locked rotor test aborts. | Nameplate data is incorrect | Verify that the motor nameplate data are entered correctly. Re-run locked rotor test (M71).<br>Also see note 1 at the end of Section 5.5. |
| Drive does not accept a run command from the controller and no faults are declared. | The SVT 'Module' key has been hit. | Re-run the test. Hitting the 'Module' key will abort the self-commissioning test and put the drive into shut-down mode. |
| | The SVT was unplugged during the test and plugged back in. | Re-run the test. Unplugging the service tool has the same effect as hitting the 'Module' key. |
| Fault: Inverter OCT<br>Motor Overload | Motor is phased improperly. | Check motor phasing and re-run test. |
| | Motor nameplate data is incorrect, or the elevator duty is greater than the motor rating. | Check for errors in motor nameplate parameter data M34. Specifically, make sure that the data entered is the nameplate data and not the contract data (unless they are the same). Also, verify that the car is empty during tests. |

| *Fault* | *Possible Cause* | *Steps to take* |
|---|---|---|
| `059 RTC is zero` | A serious problem with internal drive software has occurred | Restart locked rotor tests.<br>Also see note 1 at the end of Section 5.5. |
| `065 Wrong direct` | The car moved in the up direction when the drive SVT asked for a down run or viceversa | Run the car in the direction asked for by the service tool. It may be advantageous to restart the test. |
| `066 PTR Timeout` | The user waited longer than two minutes to enter a PTR command from the controller | Start test over. The user has two minutes to enter a car call and run the elevator or a fault will be logged. |

| | | |
|---|---|---|
| 067 Car nt empty | The car is not empty or the overbalance is wrong | Check that the car is empty and/or the overbalance and run the test again |
| 071 FT Itq !comp | The torque current was not computed at the end of fine tuning tests. Possible problem with magnetizing inductance. | Restart fine tuning tests. |
| 073 Run too shrt | The run was too short so that there was not enough time at speed. | Run the car between two floors that are farther apart so that the car reaches constant speed for at least 2 seconds. |
| 074 Drive Fault<br>075 Drive SAS | A drive fault was logged, not related to self commissioning. | View the event log and determine which fault caused the drive fault and troubleshoot accordingly. |
| 079 Kp RTR Fault | The LRT KP test timed-out because the drive state did not reach RTR. | This fault should not occur and may indicate a software bug. If this fault is encountered, then check event log for other events, and notify Farmington engineering. |

The following faults can occur during locked rotor tests. The occurrence of any of these faults indicate a serious problem with the drive and they should, in theory, never be observed:

| *Fault* | *Possible Cause* | *Steps to take* |
|---|---|---|
| 050 KP negative<br>052 KI negative<br>054 LSIG negativ<br>055 RTCr negativ<br>057 SWEEP negatv<br>058 RTC negative<br>059 RTC is zero<br>060 RTC negative | The cause of any of these faults is a bad feedback from the DSP This usually indicates a severe problem. | There is no action to be taken by the user. A fault of this nature should be reported to Engineering<br>Also see note 1 at the end of Section 5.5. |

The following warnings indicate that the locked rotor tests have taken longer to converge than usually required. The usual course of action for these warnings is to complete the tests, save data to EEPROM and try the fine tuning tests. If the obtained parameters are not too far off the actual parameters, the fine tuning stage will recover and converge to the correct parameters. As a last resort, the parameters “Lr Ampl KP/Ki PU” and “LR Ampl RTC PU” can be increased from their default settings and the tests run again.

| *Warning* | *Possible Cause* | *Steps to take* |
|---|---|---|
| 051 KP not conv<br>053 KI not conv<br>056 RTCr not cnv<br>061 RTC not conv | Bad nameplate data. Bad signal to noise ratio when getting data. | Finish the tests and save the obtained data to EEPROM. Fine tuning Will recover from slightly off locked rotor data.<br>Also see note 1 at the end of Section 5.5. |

The following faults indicate a serious problem with the calculation of the operating point for the motor (the relationship between voltage, speed and frequency) during the final stage of locked rotor tuning.

| *Fault* | *Possible Cause* | *Steps to take* |
|---|---|---|
| 062 ID&V diverge | Possible problems with magnetizing or transient inductances calculated in previous | To invoke an alternative calculation, hit SHIFT-ENTER.<br>-or-<br>Set “Rated mtr I Arms” (if known) and try to |

| Fault | Possible Cause | Steps to take |
|---|---|---|
| | tests. | rerun entire locked rotor tests.<br>Also see note 1 at the end of Section 5.5. |
| 063 NO Op Point | The nameplate data is not correct or there is a problem with magnetizing or transient inductances calculated in previous tests. | Check nameplate data, rerun entire set of locked rotor tests.<br>Also see note 1 at the end of Section 5.5. |
| 064 Imag>drv Rtd | The nameplate data is not correct or there is a problem with magnetizing or transient inductances calculated in previous tests. | Check nameplate data, rerun entire set of locked rotor tests.<br>Also see note 1 at the end of Section 5.5. |

The following faults indicate a problem in the convergence of the fine tuning or inertia tests. The fine tuning and inertia tests perform up and down runs to gather data. One set of up and down runs is considered one try. The number of tries (and therefore up and down runs) is limited because the tests should converge fairly quickly. If these tests do not converge then there is probably a problem in the fine tuning tests. The steps to take for these faults are difficult to determine until we get some more experience.

| Fault | Possible Cause | Steps to take |
|---|---|---|
| 068 FT RTC !conv | Rotor time constant fine tuning took longer than ten tries. | Restart fine tuning tests. |
| 069 FT not conv | The drive took longer than five rotor time constant/magnetizing current sets to fine tune. | Restart fine tuning tests. |
| 070 FT ID ! conv | Magnetizing current fine tuning took longer than ten tries | Restart fine tuning tests. |
| 072 Ineria !conv | Inertia tuning took longer than 10 tries | Restart inertia test. |

**Note 1: Troubleshooting when Low Voltage Operation is Active**

If the parameter “Low Volt Op 0/1” is set to 1 and the locked rotor test fails, try changing the parameter “Low Volt Op 0/1” to 0 and repeating the locked rotor test. After the locked rotor tests, the “Low Volt Op 0/1” parameter should be set back to 1.

## 1. Installation Data

Location : _____

Date : _____

Installer : _____

## 2. Hoistway Data

| | | | | | |
|---|---|---|---|---|---|
| Duty Load | : _____ | kg | Machine (e.g. 18ATF) | : _____ | |
| Duty Speed | : _____ | m/s | Rise | : _____ | m |
| Gear Ratio | : _____ | | Sheave Diameter | : _____ | m |
| Roping (1:1 or 2:1) | : _____ | | Guides (Slide/Roll) | : _____ | |

## 3. Drive Setup Data

| | | | | | |
|---|---|---|---|---|---|
| M11 GDCB-SW SCN | : _____ | | M31 Drive Type | : _____ | Amps |
| M31 Rated rpm | : _____ | rpm | M31 AC Main Vrms | : _____ | Vrms |

**If you already have parameters for this system, i.e. you are only testing the software or you want to double check your parameters with self-commissioning complete the following section with the existing parameters. If this is not the case then proceed directly to the Motor Data Section**

## 4. Existing Drive Parameters Affected By Self Commissioning

| | | | | | |
|---|---|---|---|---|---|
| M31 Inertia kg-m2 | : _____ | kg-m2 | M34 Rtr Time Const s | : _____ | s |
| M34 Rated Mag I A | : _____ | A | M34 Rated Trq I A | : _____ | A |
| M34 Rated Trq Nm | : _____ | N-m | M34 Ld mH | : _____ | mH |
| M34 R Ohm | : _____ | Ohms | M34 Lq mH | _____ | mH |

## 5. Motor Data (from nameplate – enter in SVT M34)

Manufacturer : _____ Model No. : _____

M34 Mtr Shft Pwr kW : _____ kW M34 Rtd Mtr Ln-Ln V : _____ V

M34 Rtd Mtr Spd RPM : _____ rpm M34 Rtd Mtr Freq Hz : _____ Hz

M34 Rtd Mtr I Arms _____ Arms M34 Low Volt Op 0/1 _____ 0/1

## 6. Self-Commissioning Process Data

Test M72 RTC Fine Tuning

Length of Run : _____

# UP/DOWN : _____

Test M73 Inertia Tuning

Length of Run : _____

# UP/DOWN : _____

## 7. Self-Commissioned Parameter Values

M12 LR Motor L : _____ mH M12 LR Motor R Ohm : _____ ohm

M12 LR Lsig mH : _____ mH M12 LR Rtc Re s : _____ sec

M12 LR Rtc Im _____ sec M12 LR Lphi Im _____ mH

M12 LR Lphi Re mH : _____ mH M12 LR Rated Mag I A : _____ A

M12 LR Rated Trq I A : _____ A M12 LR Rated Trq Nm _____ N-m

M12 LR Inertia kg- _____ kg-m2

M12 Fine Tune RTC : _____ S M12 Fine Tune Imag A : _____ A

M12 Fine Tune Lphi : _____ H M12 Fine Tune Itrq A : _____ A

M31 Inertia kg-m2 : _____ kg-m2 M34 Rated Trq Nm : _____ N-m

M12 Fine Tune Volt V : _____ V

## 8. Installer Comments

After self-commissioning, is the elevator performance OK? YES NO
If NO, what is wrong?

How difficult was self-commissioning to use? Easy 1 2 3 4 5 Hard

List any faults that occurred during Self-Commissioning:

# 6 Service Tool

The Service Tool (SVT) is the user's access to the subsystem software and is used to view and change parameters in EEPROM, to view run-time data, and to examine the Event Log. The menu categories are displayed in the following format:

```
MONITOR          1
                 <>
```

In this example, the user is currently in menu category 4 and has the choice of entering menu category 41 by either pressing 1 or by pressing the ENTER key sequence. Other menu categories are accessible by pressing the GO ON key or by navigating with any of the following keys:

| Key Sequence | Description | Example: Before Key Sequence | Example: After Key Sequence |
|---|---|---|---|
| MODULE | Resets the display to the main *system menu*. This key (designated "M") followed by "4" (in 422 type systems; "2" for CAN systems) navigates to the first category of the first-level drive menu (see table on next page). | – | DRIVE SYSTEM<br><> |
| FUNCTION | Resets the display to the first category of the first-level drive menu (except when the display is at the *system menu*). | – | MONITOR 1<br><> |
| SET | Navigates *up* one level in the menu tree. | Duty Speed mm/s<br>1780 | SETUP 3-1<br><> |
| GO ON | Scrolls *forward* through menu categories. | MONITOR 1<br><> | EVENT LOG 2<br><> |
| SHIFT-GO BACK | Scrolls in *reverse* through menu categories. | EVENT LOG 2<br><> | MONITOR 1<br><> |
| SHIFT-ENTER | Navigates *down* one level in the menu tree. | MONITOR 1<br><> | STATUS 1-1<br><> |
| 1 through 9 | Navigates *down* one level in the menu tree according to the selected number ('3' is used as the example). | MONITOR 1<br><> | SETUP 3-1<br><> |
| CLEAR | Clears one digit when entering a new parameter value. | Duty Load k<br>1000> 123XX | Duty Load k<br>1000> 12XXX |

## 6.1 Service Tool Access Level

The drive has multiple levels of service tool feature access. The access level of the tool the user has connected to the drive determines the access level that will be granted to the user. The levels of access are:

| | |
|---|---|
| **L1 Access** | Level 1 service tool access – includes the service tool features required to maintain the elevator |
| **L2 Access** | Level 2 service tool access – includes the service tool features required to install the elevator |
| **L3 Access** | Level 3 service tool access – includes the service tool features restricted to trained remote experts |

The only exception is when a remote administrator temporarily raises the access level of the drive to L2, allowing a user with a L1 tool connected locally in the machine room to gain L2 access.

Note: In CAN-based systems, the drive supports the ZKIP (Zero Knowledge Interactive Proof) concept allowing remote SVT access from the drive's SVT port to other components that require authentication (e.g. GECB).

## 6.2 Menu Tree

The following table shows the service tool menu tree for the drive subsystem and the access levels.

| System Level Menu | First Level Drive Menu | Second Level Drive Menu | Access Level |
|---|---|---|---|
| DRIVE SYSTEM | 1 MONITOR | 1-1 STATUS | 1 |
| | | 1-2 MOTOR | 1 |
| | | 1-3 MOTION | 1 |
| | | 1-4 INVERTER | 1 |
| | | 1-5 DISCRETES | 1 |
| | | 1-6 METRICS | 1 |
| | | 1-7 VANES | 2 |
| | | 1-8 ENGINEERING | 3 |
| | 2 EVENT LOG | 2-1 VIEW CURRENT | 1 |
| | | 2-2 VIEW SAVED | 1 |
| | | 2-3 CLEAR LOG | 1 |
| | | 2-4 CLEAR BLOCK | 1 |
| | | 2-5 RESET DSP | 1 |
| | | 2-6 CLEAR COUNTS | 2 |
| | 3 SETUP | 3-1 CONTRACT | 2 |
| | | 3-2 ADJUSTMENT | 1 |
| | | 3-3 BRAKE | 2 |
| | | 3-4 MACHINE | 2 |
| | | 3-5 PROFILE | 2 |
| | | 3-6 FACTORY | 2 |
| | 4 LANDINGS | 4-1 LEARN RUN | 1 |
| | | 4-2 LANDG TABLE | 2 |
| | | 4-3 FIND BOTLDG | 1 |
| | 5 TEST | 5-1 FAN TEST | 1 |
| | | 5-2 TURNOVR TST | 1 |
| | | 5-3 BRAKETRQ TST | 2 |
| | | 5-4 RESERVED | - |
| | | 5-5 OPT ARO TEST | 2 |
| | | 5-6 BUFFER/ETSD | 1 |
| | | 5-7 NTSD TEST | 1 |
| | | 5-8 OVERSPD TST | 1 |
| | 6 ENGINEERING | 6-1 ENG ADJUST | 2 |
| | | 6-2 ENG TEST | 3 |
| | | 6-3 DAC | 3 |
| | | 6-4 I2C EEPROM | 2 |
| | 7 SELF-COMM | 7-1 LOCKED ROTOR | 2 |
| | | 7-2 FINE TUNING | 2 |
| | | 7-3 INERTIA | 2 |

## 6.3 Monitor Menu

The Service Tool can be used to display parameters, which are either measured values of external quantities, or values that are computed internally. The service tool does partial updates to the display every 40ms.

An overview of all parameters is listed below. Not all parameters may be visible or accessible. Visibility and accessibility are listed in the table below. Visibility is explained further in a following Section.

| Display Text | Visibility | Access Level |
|---|---|---|
| **1-1 STATUS** | | |
| NORMAL IDLE UP | ALL | 1 |
| Regen 60A Ver 1 | ALL | 2 |
| Package s/n | eI2C | 2 |
| PBX_INV s/n | eI2C | 2 |
| PDB_II s/n | eI2C | 2 |
| PBX_CONV s/n | eI2C | 2 |
| GDCB-SW SCN | ALL | 1 |
| GDCB-SW CRC | ALL | 1 |
| Primary Ldr SCN | ALL | 1 |
| Primary Ldr CRC | ALL | 1 |
| CPLD Version | ALL | 1 |
| CAN ICD type | CAN | 2 |
| Hitch LoadW SCN | CAN+ LW2 | 2 |
| UCM-EN LIB SCN | CAN and UCM-EN on/off=1 | 2 |
| es MONITOR_UCM | CAN+ UCM-EN on/off=1 | 2 |
| Clock | ALL | 1 |

| Display Text | Visibility | Access Level |
|---|---|---|
| **1-2 MOTOR** | | |
| BrkTrq:%Load Iq | BTT | 2 |
| BT/kgm:Rate Ref | BTT | 2 |
| P(m) m/m A V | ALL | 1 |
| InvNomLmt: % A | JIS | 2 |
| InvRevLmt: % A | JIS | 2 |
| Rel Lmt ActLmt A | JIS | 2 |
| PwrFS(.1Kw) Pwr% | CAN | 2 |
| Motor: RPM | ALL | 1 |
| Mtr:Arms Vrms | ALL | 1 |
| Mtr: Hz kW | ALL | 1 |
| Mtr: Id Iq | ALL | 1 |
| Mtr: Vd Vq | ALL | 2 |
| MagErr1 MagErr2 | PM | 2 |
| Lrt: Ld Lq mH | PM | 2 |
| Lrt:L min/max mH | PM | 2 |
| LR Motor L mH | SELF | 2 |
| LR Motor R Ohm | SELF | 2 |
| LR Lsig mH | SELF | 2 |
| LR Rtc Im s | SELF | 2 |
| LR Rtc Re s | SELF | 2 |
| LR Lphi Im mH | SELF | 2 |
| LR Lphi Re mH | SELF | 2 |
| LR Rated Mag I A | SELF | 2 |
| LR Rated Trq I A | SELF | 2 |
| LR Rated Trq Nm | SELF | 2 |
| LR Inertia kg-m2 | SELF | 2 |
| Fine Tune RTC s | SELF | 2 |
| Fine Tune Imag A | SELF | 2 |
| Fine Tune Lphi H | SELF | 2 |
| Fine Tune Itrq A | SELF | 2 |
| Fine Tune Volt V | SELF | 2 |
| PrF NTSD Tim Lmt | OVF | 2 |

| Display Text | Visibility | Access Level |
|---|---|---|
| **1-3 MOTION** | | |
| Vel: Ref Fbk | ALL | 2 |
| Pos: Fbk Target | CAN | 2 |
| ToTgt Over T200 | CAN | 2 |
| ESTOP @ mm/s -> | ALL | 1 |
| BrkDelay BrkStop | ALL | 2 |
| RopeSlip TotSlip | CAN | 1 |
| BLOn Max Min Act | ALL | 1 |
| BLOffMax Min Act | ALL | 1 |
| BS off Max Act | ALL | 1 |
| Pos: DTG Start | CAN | 2 |
| EncPulse RPM | ALL | 2 |
| PG: Acc SD | CAN | 2 |
| Lwabs:kg % | CAN and LW1/ LW2 | 1 |
| Lwimbal:kg % | ALL | 2 |
| LW: Fbk % Adj % | DLW | 2 |
| Unbalance % kg | ALL | 2 |
| BeltCmp:Iq A | CAN | 2 |
| BeltCmp:Slp mA/m | CAN | 2 |
| BeltCmp:Offset A | CAN | 2 |
| Rllbck: mm Num | CAN | 1 |
| RbTrgt: mm Num | CAN | 2 |
| Vel Entering DZ | CAN | 1 |
| Braking Dist mm | ALL | 2 |
| HitchLw: Empty: | CAN+ LW2 | 2 |
| HitchLwSensor: | CAN+ LW2 | 2 |
| PT LdT Iref Ld% | CAN | 2 |
| Data Thr Num LWS | LW2 | 2 |
| LSC LDZ 1LS 2LS | CAN | 1 |

| Display Text | Visibility | Access Level |
|---|---|---|
| **1-4 INVERTER** | | |
| Inp:Vrms Vdc | ALL | 1 |
| Ac/Dc cal fctr % | LVO | 2 |
| Cnv:Vrms Arms | ALL | 2 |
| Cnv: Id Iq | ALL | 2 |
| Temp:Cnv Inv | ALL | 1 |
| Fan Duty % | NOT_OVF | 2 |
| BW(Hz):Cnv Inv | ALL | 2 |
| Cnv Reg Freq(Hz) | ALL | 2 |
| Inv Reg Freq(Hz) | ALL | 2 |
| Brake Current A | IBRK | 1 |
| Battery Volts V | BAT | 1 |
| Brake Volt PWM % | DG_OVF_B RK_BPCB_V | 2 |
| BkCur:Ref Fbk | OVF_BRK | 2 |
| Brk kp ki | DG_OVF_B RK_BPCB_A | 2 |
| Brk Vdc V Duty% | OVF_BRK | 2 |

| **1-5 DISCRETES** | | |
|---|---|---|
| PTR RTR LB BL | ALL | 1 |
| DL DF SAS | ALL | 1 |
| BS1 BS2 BY BST | ALL* | 1 |
| SX DBD SNO SAF | ALL | 1 |
| MAN MUP MDN | 422 | 1 |
| MX PX DX BX | ALL | 1 |
| UP DN RG DS | ALL | 1 |
| UIS LV1 LV2 DIS | CAN | 1 |
| FLR NCF CTF ATF | CAN | 1 |
| 1LS 2LS UIB DIB | CAN | 1 |
| RSW PFL UPS DBR | ALL/CAN | 1 |
| DS DS1 DS2 FLR | ALL | 2 |
| SHK BAT EAR SUS | JIS | 1 |
| RLM RLD BTT BTC | JIS | 1 |
| MOC BOD CZO FAN | ALL | 1 |
| UDX ETS SSB OEN | OVF | 1 |
| SSX SMG SR1 EMG | JIS | 1 |
| AR1/2 CrF CrS | OARO | 1 |
| SLV RCF LV1 LV2 | CAN | 1 |
| FLR Mid EQAR-R/S | JIS_CAN | 1 |
| RST RSC SPM | JIS | 1 |

| Display Text | Visibility | Access Level |
|---|---|---|
| **1-6 METRICS** | | |
| ALWA_DISPLAY | ALWA | 1 |
| Flight Time | ALL | 1 |
| Flight Length mm | ALL | 1 |
| Number of Runs | ALL | 1 |
| Runs Since Event | ALL | 1 |
| Max AC Main Vrms | ALL | 2 |
| Max Temp C | NOT_OVF | 2 |
| Max DC Bus V | ALL | 1 |
| Max Motor Arms | ALL | 2 |
| Max Cnv Arms | ALL | 2 |
| Cap Time In Use | ALL | 2 |
| Fan Time In Use | NOT_OVF | 2 |
| Tot. Time In Use | ALL | 2 |
| Metric E2 Writes | ALL | 2 |
| Event E2 Writes | ALL | 2 |
| Position @pwroff | CAN | 1 |
| OMU Prohibited | ALL | 2 |
| LW % @pwroff | CAN | 1 |
| Max Enc Cnt | ALL | 2 |
| DDP sec | ALL | 1 |
| ARD DDP sec | ALL | 1 |

| **1-7 VANES** | | |
|---|---|---|
| SlipMax mm ldg h | CAN | 2 |
| SlipRateMax mm/h | CAN | 2 |
| Slip Mitigation | CAN | 2 |
| RestTime now\|max | CAN | 2 |
| PrsSpikesFilterd | CAN | 2 |
| last SpikeLength | CAN | 2 |
| lastDeviation | CAN | 2 |
| lastCorr @mm/s2 | CAN | 2 |
| avgDevInRun | CAN | 2 |
| avgCorrInRun | CAN | 2 |
| maxDevInRun @ldg | CAN | 2 |
| maxCorInRun @ldg | CAN | 2 |
| Offset UIS 0.1mm | CAN | 2 |
| Offset 1LV 0.1mm | CAN | 2 |
| Offset 2LV 0.1mm | CAN | 2 |
| Offset DIS 0.1mm | CAN | 2 |
| LS1 length mm | CAN | 2 |
| LS2 length mm | CAN | 2 |
| LS length min mm | CAN | 2 |
| AHC fault count | CAN | 2 |
| AHC Permissive | CAN | 2 |
| AHC Pos Delta mm | CAN | 2 |
| AHC: Car Mach | CAN | 2 |
| AHC: Kd used | CAN | 2 |

| Display Text | Visibility | Access Level |
|---|---|---|
| **1-8 ENGINEERING** | | |
| Test Variable 1 | ALL | 3 |
| Test Variable 2 | ALL | 3 |
| Test Variable 3 | ALL | 3 |
| Test Variable 4 | ALL | 3 |
| Test Variable 5 | ALL | 3 |
| Test Variable 6 | ALL | 3 |
| CPU:Max% Avg% | ALL | 3 |
| Tsk 1ms% 10ms% | ALL | 3 |
| Cnv% Inv% All% | ALL | 3 |
| E2 Load Time ms | ALL | 3 |
| Stack Used Max% | ALL | 3 |
| Vel Scale mm/s | ALL | 3 |
| Drv I Scl Rated | ALL | 3 |
| MagPos /LRT eDeg | PM | 3 |
| ADC:gain% offset | ALL | 3 |
| Reactor I Arms | ALL | 3 |
| Inert used kg-m2 | ALL | 3 |
| mm @accumEncPls | ALL | 3 |
| Vel Reg Hz | ALL | 3 |
| Cnv Reg Hz | ALL | 3 |
| VTE Parameters | CAN | 3 |
| VTE Dtbc:est mea | CAN | 3 |
| VTE Dbc:HyAcLgLd | CAN | 3 |
| VTE MaxDevFrmNom | CAN | 3 |
| VTE MaxResidl SE | CAN | 3 |
| VTE MaxResidl OE | CAN | 3 |
| BSLP 3Margin mm | CAN | 3 |

### 6.3.1 Parameter Visibility

Some of the display parameters are not always visible in the SVT. The visibility, listed in the table in the previous Section, is explained in more detail in the following table.

| Abbreviation | Visibility |
|---|---|
| ALL | All configurations. |
| 422 | Only if Interface Type = 0 |
| JIS | Only for “JIS Function 0/1” = 1 or 2 or 234G, 416G, 428G or 460G drives . |
| CAN | Only if Interface Type = 1 |
| eI2C | Only if drive uses power boards with enhanced I2C EEPROM storage capability |
| LW1 | Only if Load Weigh Type = 1 |
| LW2 | Only if Load Weigh Type = 2 |
| IBRK | Only if internal brake current feedback is supported in the drive hardware |
| BAT | Only if battery mode |
| PM | Only if PM motor |
| SELF | Only if Auto Tune = 1 |
| DLW | Only if Load Weigh Type = 3 |
| ALWA | Only if ALWA Config = 1 |
| LVO | Only when Low Voltage Operation active |
| OVF | Only for 234G, 416G, 428G and 460G drives |
| NOT_OVF | Excepts the 234G, 416G, 428G and 460G drives |
| OVF_BRK | Only for 234G, 428G and 460G drives with Brake control by “BCM present 0/1 = 1”, or “Int Brk Type 0-4 = 2” |
| OVF_BRK_BPCB_A | Brake control by “BCM present 0/1 = 1”, or “Int Brk Type 0-4 = 2” |
| OVF_BRK_BPCB_V | Only “Int Brk Type 0-4 =4 “ |
| OARO | Only if Optimized ARO enabled. |
| BTT | Only if Brake Torque test active |
| JIS_CAN | Only for “JIS Function 0/1” = 1<br>And “Interface Type = 1”<br>Except OVF412RCR drive |

### 6.3.2 Display Format

The display menu can show 1, 2, or 4 variables at the same time. The display will look like the following when one parameter is displayed:

```
GDCB-SW SCN
AAA30924CAA
```

When two parameters are displayed:

```
Mtr:Arms     Vrms
   32.0     500.0
```

When four parameters are displayed:

```
PTR RTR  LB  BL
  1   1   1   1
```

.

The following sections give detailed explanations for each display parameter.

### 6.3.3 1-1 STATUS

| SVT Display | Description |
|---|---|
| NORMAL IDLE UP<br><RSC UP> 00<br><br><br>cccccc llllll dd<br><ttt yy> ff | **Motion Command Mode (cccccc)**<br>NO_RUN - No run command<br>NORMAL - Drive waits for a run command from TCBC-type controller.<br>RELEVEL - Relevel run<br>ERO - Electrical Recall Operation<br>CORR - Correction Run<br>RESCUE - Rescue Run<br>LEARN - Learn Run<br>MRO - Manual Rescue Operation<br>TCI - Top of Car Inspection<br>MCSS - Run command from MCSS-type controller<br>MAN - Manual Mode<br>DAT - Run command from Data Acquisition Tool<br>**Motion Logic State (llllll)**<br>PWR_DN – Power Down RUN - Running<br>PRECHG – Precharge PTR - Prepare to run<br>SHUTDN – Shutdown LF_BRK - Lift Brake<br>NO_SAF - Wait For Safety DECEL - Stopping<br>IDLE - Idle DR_BRK – Drop Brake<br>TARGET – At Target<br>**Car Direction (dd)**<br>UP - Up direction<br>DN - Down direction<br>-- - No direction<br>**Motion Command from TCBC-type controller (tttt)**<br><WT - WAIT, the drive waits for the next run command<br><TCI - Top of Car Inspection<br><ERO - Electrical Recall Operation<br><COR - Correction Run<br><RSC - Rescue Run<br><GOTO - Normal run to floor number<br><REL - Releveling<br>**Commanded Direction (yyy)**<br>UP> - Up direction<br>DN> - Down direction<br>ST> - Stop<br>EN> - Enable<br>**Current Floor (ff)**<br>Displays the current floor of the car |

| | |
|---|---|
| Regen 60A Ver 1<br>480V/ 60A | **1st line:** Currently selected drive type:<br>Regen 25A Ver 1 - 25A Regenerative Drive (MAN)<br>Regen 40A Ver 1 - 40A Regenerative Drive (MAN)<br>Regen 60A Ver 1 - 60A Regenerative Drive (MAN)<br>Regen 90A Ver 1 - 90A Regenerative Drive (MAN)<br>Regen 120A Ver 1 - 120A Regenerative Drive (MAN)<br>Regen 15A Ver 2 - 15A Regen Drive (MAN, eI2C)<br>Regen 20A Ver 2 - 20A Regen Drive (MAN, eI2C)<br>Regen 20A Ver 2.1 - 20A V.2.1 Regen Drive (eI2C)<br>Regen 30A Ver 2 - 30A Regen Drive (MAN, eI2C)<br>Regen 30A Ver 2.1 - 30A V.2.1 Regen Drive (eI2C)<br>Regen 30A Ver 2.2 - 30A V.2.2 Regen Drive (eI2C)<br>Regen 40A Ver 2 - 40A Regen Drive (MAN, eI2C)<br>Regen 40A Ver 2.1 - 40A V.2.1 Regen Drive (eI2C)<br>Regen 40A Ver 2.2 - 40A V.2.2 Regen Drive (eI2C)<br>Regen 60A Ver 2 - 60A V.2 Regen Drive (eI2C)<br>Regen 120A Ver 2 - 120A V.2 Regen Drive (eI2C)<br>Regen 160A Ver 2 - 160A V.2 Regen Drive (eI2C)<br>Regen 280A Ver 1 - 280A V.1 Regen Drive (MAN)<br>Regen 340A Ver 1 - 340A V.1 Regen Drive (MAN)<br>Regen 600A Ver 1 - 600A V.1 Regen Drive (MAN)<br><br>**2nd line:** indicates max. line voltage and max. output current.<br><br>Note: (MAN): manually set; see parameter “Drive Type”<br>(eI2C): auto- detected; for drives with eI2C EEPROM storage capabilities.<br>If drive type auto- detecting fails then an error message will be displayed instead:<br><br>Package setting<br>undefined<br><br>Note that some drives support both methods of drive type setting depending on power board (HVIB) version. |
| Package s/n<br>244629000003 | Package serial (barcode) number (example)<br>If the EEPROM is unreadable or if the stored string is non-ASCII then a row of stars are displayed instead of the serial number. |
| PBX_INV s/n<br>244629000003 | **1st line:** Name of power board 1 (if available):<br>PBX_INV - for 60A V.2<br>PBX_BIDI(I) - for 120A and 160A V.2 (PBX_BIDI; MX1 assembly)<br>HVIB - for 15A, 20A, 30A and 40A V.2<br>HVIB_II - for 20A, 30A, and 40A V.2.1, 30A and 40A V.2.2<br>**2nd line:** Serial (barcode) number of this board (example).<br>If the EEPROM is unreadable or if the stored string is non-ASCII then a row of stars are displayed instead of the serial number. |
| PDB_II s/n<br>244629000003 | **1st line:** Name of power board 2 (if available):<br>PDB_II - for 60A, 120A and 160A V.2<br>**2nd line:** Serial (barcode) number of this board (example).<br>If the EEPROM is unreadable or if the stored string is non-ASCII then a row of stars are displayed instead of the serial number. |

| | |
|---|---|
| PBX_CONV s/n<br>244629000003 | **1st line:** Name of power board 3 (if available):<br>PBX_CONV - for 60A V.2<br>PBX_BIDII - for 120A and 160A V.2<br>(PBX_BIDI; MX2 assembly)<br>**2nd line:** Serial (barcode) number of this board (example).<br>If the EEPROM is unreadable or if the stored string is non-ASCII then a row of stars are displayed instead of the serial number. |
| GDCB-SW SCN<br>AAA30924CAH | GDCB software version number (see software release document) |
| GDCB-SW CRC<br>8FDBAC6B | GDCB software CRC32 checksum (see software release document) |
| Primary Ldr SCN<br>AAA31013AAE | Primary Loader software version number (see software release document). |
| Primary Ldr CRC<br>8FDBAC6B LOCK | Primary Loader software CRC32 checksum (see software release document). |
| CPLD Version<br>8 | CPLD version number. |
| CAN ICD type<br>10 | Shows the ICD version the drive's query at power up has determined for use in the OPB interface to the controller.<br>1: "Legacy" interface (no ABL nor ARO, pos retention SPBC)<br>10: Supports ABL, pos retention via GECB or SPBC (no ARO)<br>11: ICD10 + TCI limit in drive + hitch LW |
| Hitch LoadW SCN | SCN of Hitch Load Weighing Device |
| UCM-EN LIB SCN<br>G1130879AAA | Software version number of the TÜV certified library module implementing the UCM-EN functionality. |
| es MONITOR_UCM<br>dw DFC DBP<br><br>ee uuuuuuuuuuuu<br>ww fff bbb | **Unintended Car Motion Monitoring:**<br>**UCM Monitoring State (uuuuuuuuuuuu)**<br>NO_UCM_CHECK - UCM monitor inactive, leaving DZ will not cause blockage<br>MONITOR_UCM - UCM monitor active, leaving DZ will cause blockage<br>UCM_FAULT! - UCM blockage active<br>**Safety Chain (SFC) signals sent by GECB:**<br>**SFC status before door chain: ES signal (ee)**<br>es - Safety Chain closed in before door chain (="ES switch inactive")<br>ES - Safety Chain open before door chain<br>-- - signal unknown (e.g. CAN msg missing)<br>**SFC between landing and car door switches: DW (ww)**<br>DW - Safety Chain closed at end of hoistway door chain<br>dw - Safety Chain open at end of hoistway door chain<br>-- - signal unknown (e.g. CAN msg missing)<br>**SFC after car door switches: DFC (fff)**<br>DFC - Safety Chain closed at end of door chain<br>dfc - Safety Chain open at end of door chain<br>-- - signal unknown (e.g. CAN msg missing)<br>**State of Door Bypass: DBP (bbb)**<br>DBP - Door Bypass closed<br>dbp - Door Bypass open<br>-- - signal unknown (e.g. CAN msg missing) |

| | |
|---|---|
| Clock | Time since POR.<br>Format: DAYS:HOURS:MIN:SEC:10MSEC. |

### 6.3.4 1-2 MOTOR

| SVT Display | Description |
|---|---|
| BrkTrq:%Load Iq | This monitor is for “Brake maintained torque”.<br>%Load - Set parameter in percent<br>Iq - q-axis motor current vector (Iq_reference) (Arms) |
| BT/kgm:Rate Ref | This monitor is for “Brake maintained torque”.<br>Rate - Brake maintained torque of 100% load (kgm)<br>Ref - Torque reference for Brake Maintain Test |
| P(m) m/m A V | P(m) - Running distance by the encoder (m)<br>m/m - Velocity feedback as measured by the encoder (m/min)<br>A - Motor current (Arms)<br>V - Motor voltage (Vrms) |
| InvNomLmt: % A | % - Displays the value of “Inv I Limit %”<br>A - Displays effective current by “Inv I Limit %”. |
| InvRevLmt: % A | % - Displays the value of “Inv ReLe Ilimit%”<br>A - Displays effective current by “ Inv ReLe Ilimit%” |
| Rel Lmt ActLmt A | Lmt - Displays effective current by “ Inv ReLe Ilimit%”<br>ActLmt – Display of Actual Drive limit in the run |
| PwrFS(.1Kw) Pwr% | This data is used for regen CAN message publication.<br>PwrFS – Full scale power, in units of 0.1kW<br>Pwr% - instantaneous convereter power, as a percentage of the full scale value. |
| Motor: RPM | RPM - Motor speed as measured by the encoder (rpm) |
| Mtr:Arms Vrms | Arms - Motor current (Arms)<br>Vrms - Motor voltage (Vrms) |
| Mtr: Hz kW | Hz - Motor frequency (Hz)<br>kW - Motor power (kW) |
| Mtr: Id Iq | Id - d-axis motor current vector (A)<br>Iq - q-axis motor current vector (A) |
| Mtr: Vd Vq | Vd - d-axis motor voltage vector (V)<br>Vq - q-axis motor voltage vector (V) |
| MagErr1 MagErr2 | Difference between the magnet position derived from the encoder and the result of the Locked Rotor Test (LRT), and the estimated position of the magnets based on the back-EMF of the motor.<br>MagErr1: Check during motor speed more than 30% of the rated rpm<br>MagErr2: Only Monitor during constant speed, no fault check<br>Used to detect the following fault: 504 Enc Pos<br>See EEPROM parameter: Mag err thr eDeg<br>See EEPROM parameter: Rated Motor rpm |
| Lrt: Ld Lq mH | Motor d-axis and q-axis inductance estimates based upon the LRT result. This can be used as a rough estimate for current regulator tuning. |
| Lrt:L min/max mH | Locked rotor test minimum and maximum inductance estimate as a function of rotor perimeter.This can be utilized to asses the quality of the locked rotor test. |
| LR Motor L mH | Motor inductance (proportional gain of current regulators) determined during self commissioning locked-rotor tests |
| LR Motor R Ohm | Motor resistance (integral gain of current regulators) determined during self commissioning locked-rotor tests |

| | |
|---|---|
| LR Lsig mH | Motor Transient Inductance ($L_1 - L_m^2/L_2$) determined during self commissioning locked-rotor tests |
| LR Rtc Im s | Rotor time constant ($L_2/R_2$) determined using the imaginary impedence during self commissioning locked-rotor tests |
| LR Rtc Re s | Rotor time constant ($L_2/R_2$) determined using the real impedence during self commissioning locked-rotor tests |
| LR Lphi Im mH | Effective magnetizing inductance ($L_m^2/L_2$) determined using the imaginary impedence during self commissioning locked-rotor tests |
| LR Lphi Re mH | Effective magnetizing inductance ($L_m^2/L_2$) determined using the real impedence during self commissioning locked-rotor tests |
| LR Rated Mag I A | Magnetizing current determined during self commissioning locked-rotor tests |
| LR Rated Trq I A | Torque current that produces motor rated torque. Determined during self commissioning locked-rotor tests |
| LR Rated Trq Nm | Motor torque produced at the rated torque current and rated magnetizing current. Determined during self commissioning tests |
| LR Inertia kg-m2 | Rotating inertia of elevator system referred to the motor shaft. Determined during self commissioning locked rotor test |
| Fine Tune RTC s | Final value of rotor time constant ($L_2/R_2$). Determined during self commissioning fine-tuning tests |
| Fine Tune Imag A | Final value of magnetizing current. Determined during self-commissioning fine-tuning tests |
| Fine Tune Lphi H | Final value of effective magnetizing inductance ($L_m^2/L_2$). Determined during self commissioning fine-tuning tests |
| Fine Tune Itrq A | Final value of motor torque current. Determined during self commissioning fine-tuning tests |
| Fine Tune Volt V | Motor voltage at end of constant-speed portion of elevator down run. Parameter determined during self commissioning |
| PrF NTSD Tim Lmt | PrF - Drive Profile Status<br>0: Idle or Low speed or Invalid 1: Acceleration<br>2: Deceleration 3: Constant speed<br>NTSD – NTSD mode bit from MCSS<br>Tim - Interval time each NTSD mode (Unit:second)<br>680 sec is set after NTSD with drive limit extension<br>0 is available of drive limit extension for NTSD<br>Lmt - Drive limit current (Arms)<br>If drive receives NTSD mode from MCSS, it displays the NTSD drive limit A rms. |

## 6.3.5 1-3 MOTION

| SVT Display | Description |
|---|---|
| Vel: Ref Fbk | Ref - Velocity reference dictated by MCSS or the drive's internal profile generator<br>Fbk - Velocity feedback as measured by the encoder (mm/s). |
| Pos: Fbk Target | Fbk - Position feedback measured by the encoder (mm).<br>Target – Position target (mm). |
| ToTgt Over T200 | ToTgt - Distance to target [mm], positive when overshooting, negative when landing short (independent of up/down).<br>Over - Max overshoot [mm] beyond target.<br>T200 - Time for stopping phase [ms] from vel ref=200mm/s to brake dropped. |

| | |
|---|---|
| ESTOP @ mm/s -> | This SVT display shows the velocity (mm/s) and the next 2 displays show the slip distance (mm) of the most recent ESTOP. This information can be used for evaluating dynamic traction of an elevator. The values are reset by POR but not by subsequent runs without ESTOPs. |
| BrkDelay BrkStop | BrkDelay - mm travelled from last ESTOP to first feedback of brake dropped (first BS, I_brake < I_hold)<br>BrkStop - mm travelled by sheave from first feedback of brake dropped to complete stop |
| RopeSlip TotSlip | RopeSlip - mm of rope slip after last ESTOP, slipped while sheave moved through dropped brake and after sheave stop. This value is valid only with valid current floor and after the run following the ESTOP is completed, not directly after the ESTOP.<br>TotSlip - Magnitude of total mm car motion after last ESTOP, TotSlip = \|BrkDelay + BrkStop + RopeSlip\| . Assumes RopeSlip=0 for invalid RopeSlip. |
| BLOn Max Min Act | This measures the brake delay time from “Lift Brake ON” to “Picked Brake switch”. (Requested function for JIS field)<br>Max – Maximum Brake delay time after POR<br>Min – Minimum Brake delay time after POR<br>Act – The measured time at previous run |
| BLOffMax Min Act | This measures the brake delay time from “Lift Brake OFF” to “Dropped Brake switch”. (Requested function for JIS field)<br>Max – Maximum Brake delay time after POR<br>Min – Minimum Brake delay time after POR<br>Act – The measured time at previous run |
| BS off Max Act | This measures the delay time of brake drop from “Brake relay off” to “Dropped Brake switch”. Especially, this is useful for E-stop condition, with reflux diode in the brake control circuit.<br>Max – Maximum Brake delay time after POR<br>Act – The measured time at previous run |
| Pos: DTG Start | DTG - Actual distance to go to target (mm)<br>Start - Starting position at beginning of run (mm) |
| EncPulse RPM | EncPulse – Encoder counts (limited to 0…65535)<br>RPM – Motor RPM |
| PG: Acc SD | Acc - Acceleration reference from profile generator (mm/sec^2).<br>SD - Stopping distance from profile generator (mm). |
| Lwabs:kg % | kg - The absolute in-car load in Kilograms<br>% - The absolute in-car load in percent of duty load.<br>Note: Kilogram value is calculated out of the percent value. |
| Lwimbal:kg % | kg - The imbalance load weight in Kilograms<br>% - The imbalance load in percent of duty load.<br>Note: Kilogram value is calculated out of the percent value. |
| LW: Fbk % Adj % | Fbk: - Displays the load weighing feedback from the discrete load weighing device<br>Adj: - Displays the actual load weighing used for pretorquing prior to the run. |
| Unbalance % kg | This is to check the unbalanced torque when the overbalance is adjusted. This data is updated when the elevator is normal stop at floor, not emergency stop.<br>% - Duty load % for unbalance<br>kg – unbalanced kg<br>Duty load kg is defined with “Duty Load kg”.<br>Please refer the “6.9.5 How to check the balanced load? (For PM machine)”. |

| | |
|---|---|
| BeltCmp:Iq A | This is the additional current (A) that is added to the pretorque value to compensate for belt and traveling cable imbalance. This value is updated at the beginning of each run and depends upon the car position in the hoistway. It is calculated using two compensation parameters that are determined during the learn run (the next two parameters). |
| BeltCmp:Slp mA/m | This parameter is the variation of torque current per meter of hoistway due to belt and traveling cable imbalance. This value is determined during the learn run. If the learned value is out of range, the following fault is logged: 518 BeltCmp . The learned value can be overridden using the parameter: Belt CmpSlp mA/m |
| BeltCmp:Offset A | This parameter is half of the difference of the torque current during the constant speed portion of the run near the bottom and near the top of the hoistway. This value is determined during the learn run. If the learned value is out of range, the following fault is logged: 518 BeltCmp . The learned value can be overridden using: Belt Cmp Off A |
| Rllbck: mm Num | mm - Amount of rollback in millimeters<br>Num - The number of rollbacks in the last 40 runs. |
| RbTrgt: mm Num | mm - Amount of overshoot in millimeters<br>Num - The number of overshoots in the last 40 runs. |
| Vel Entering DZ | This parameter is used to support the TUV handover tests in which it is demonstrated that the car speed does not exceed a certain value when entering the door zone. This parameter displays the velocity in mm/sec when the car enters each door zone. The value is reset at the beginning of each run. See Section 6.9.2 for more details regarding Turnover Tests. |
| Braking Dist mm | This parameter is used to support the TUV handover tests in which the braking distance of one brake shoe is tested. This parameter displays the estimated linear distance in mm due to sheave rotation from the moment either of the brake switches indicates a brake has dropped to the moment when the sheave velocity is less than the stopping criteria, 5 mm/sec. The parameter is always calculated regardless of operating mode and is reset at the beginning of each run. See Section 6.9.2 for more details regarding Turnover Tests. |
| HitchLw: Empty: | HitchLw: The value received from the hitch load weighing device. The unit is kg. During a run the last value received during the last stop is displayed. If no value is received, a 0 is displayed.<br>Empty: The value expected from the hitch load weighing device for empty car.This value depends on the hoistway position and on the hitch load weighing calibration. The calibration is done during a learn run. It can be checked or modified by the engineering adjust parameters. |
| HitchLwSensor: | The 8 sensor inputs of the Hitch Load Weighing device can be individually checked. The sum of these 8 values must be the “HitchLw“ value above. Every sensor value is displayed sequentially for 2 seconds. The first number is the sensor number (0...7), the second one is the value in [kg].<br>Note: In some case two sensors can be wired in parallel to one hardware input. |
| PT LdT Iref Ld% | PT (A) – Pre-Torque data of Inverter current<br>Ldt (A) – Pre-Torque data with Load Weighting data<br>Iref (A) – Inverter Iq reference<br>Ld% - Load Weighting data % |
| Data Thr Num LWS | Data – The sensor inputs of the Hitch Load Weighing device<br>Thr – The threshold of “728 Slack Rope” for each Load sensor<br>Num – The sensor number for each 8 sensor<br>LWS – Number of LW sensor set by F32 “Num LwSensorData” |

| | |
|---|---|
| LSC LDZ 1LS 2LS | LSC – Counts of DZ in LS<br>LDZ – 1 = Detected DZ in LS, 0 = Out of DZ or LS<br>1LS – Number of DZ in 1LS, 0 = Outside of 1LS<br>2LS – Number of DZ in 2LS, 0 = Outside of 2LS<br>*Note: This monitor is valid only for TCI in LS.*<br>*Also this is visible only for;*<br>*"Drive Type " = 412 or 416 or 428 or 460*<br>*And "JIS Option Mode " = 80* |

### 6.3.6 1-4 INVERTER

| SVT Display | Description |
|---|---|
| Inp:Vrms Vdc | Vrms - Measured AC main input voltage (Vrms)<br>Vdc - Measured DC bus voltage (V) |
| Ac/Dc cal fctr % | This parameter indicates the degree of consistency between the voltage measurements from the dc bus and the ac line sensors for a prolonged drive idle time the dc bus is charged. 100% means mathematically that √2 * (Inp:Vrms) = Vdc ( Inp:Vrms Vdc). Note that 100% does not mean that they individually consistant with a truly calibrated voltage measurement device.<br><br>This parameter is not visible if low voltage operation (Low Volt Op 0/1) is turned off. |
| Cnv:Vrms Arms | Cnv: - Converter voltage command (Vrms)<br>Arms - measured AC main input current (Arms) |
| Cnv: Id Iq | Id - Measured d-axis converter current vector (A)<br>Iq - Measured q-axis converter current vector (A) |
| Temp:Cnv Inv | Inv - Measured Inverter IGBT or heatsink temperature (C)<br>Cnv - Measured Converter IGBT or heatsink temperature (C) |
| Temp:Cnv Inv | Inv - Measured Inverter IGBT or heatsink temperature (C) for OVF416G |
| Fan Duty % | Fan - PWM duty command for the fan (%). |
| BW(Hz):Cnv Inv | Cnv – Target bandwidth of converter current regulator (hertz)<br>Inv – Target bandwidth of inverter current regulator (hertz).<br>These numbers are used for tuning the current regulators. |
| Cnv Reg Freq(Hz) | Converter Regulator Frequency |
| Inv Reg Freq(Hz) | Inverter Regulator Frequency |
| Brake Current A | When the internal brake module is used, this is the current to the brake measured in (A). Active only when setup parameter Int Brk Type 0-4 is set to 1. |
| Battery Volts V | Voltage of the battery during ARO(EN) operation. |
| Brake Volt PWM % | Brake voltage PWM command in % |
| BkCur:Ref Fbk | Ref - Brake crrent command (A)<br>Fbk - measured brake input current. (A) |
| Brk kp ki | Proportional and integral gains of brake current regulator. |
| Brk Vdc V Duty% | Vdc - Measured brake DC bus voltage (V)<br>Duty% – PWM duty command for the Brake (%). |

### 6.3.7 1-5 DISCRETES

| SVT Display | Description |
|---|---|
| PTR RTR LB BL | PTR - prepare to run command from MCSS<br>RTR - ready to run status from drive<br>LB - lift brake command from MCSS<br>BL - brake lifted status from drive |
| DL DF SAS | DL - drive torque limit has been reached<br>DF - drive fault has been detected<br>SAS - drive stop and shutdown has occurred |
| BS1 BS2 BY BST | BS1 - brake switch 1 (see parameter: Brk Sw Type 0-6)<br>BS2 - brake switch 2 (see parameter: Brk Sw Type 0-6)<br>BY* - BY relay feedback (0-dropped/1-picked)<br>BST* - brake status feedback (0-dropped/1-picked)<br>*not visible when internal brake control active.<br>See parameter Int Brk Type 0-4. |
| SX DBD SNO SAF | SX - command to pick S1 and S2 relays (0-drop/1-pick)<br>DBD - active if normally-closed contacts of S1, S2 BY1 and BY2 relays are closed<br>SNO - normally-open contact of S1relay (0-dropped/1-picked)<br>SAF - safety chain input to drive (0-inactive/1-active) |
| MAN MUP MDN | MAN - manual mode input to drive (0-inactive/1-active)<br>MUP - manual mode up command to drive (0-inactive/1-active)<br>MDN - manual mode down command (0-inactive/1-active) |
| MX PX DX BX | MX - command to pick main contactor (0-drop/1-pick)<br>PX - command to pick precharge relay (0-drop/1-pick)<br>DX - command to pick discharge relay (0-drop/1-pick)<br>BX - drive command to pick brake relay (0-drop/1-pick) |
| UP DN RG DS | UP - car moving up<br>DN - car moving down<br>RG - motor is regenerating (0=motoring/1-regenerating)<br>DS - PWM frequency is downshifted to half the nominal frequency. |
| UIS LV1 LV2 DIS | UIS - Relevel UP sensor<br>LV1 - Door zone 1 sensor<br>LV2 - Door zone 2 sensor<br>DIS - Relevel DOWN sensor |
| FLR NCF CTF ATF | FLR - Current Floor<br>NCF - Next Committable Floor<br>CTF - Target Floor<br>ATF - Accepted Target Floor |
| 1LS 2LS UIB DIB | 1LS - Bottom Terminal Zone<br>2LS - Top Terminal Zone<br>UIB - Up Inspection Button<br>DIB - Down Inspection Button |
| RSW PFL UPS DBR | RSW - Line reactor thermal switch is open<br>PFL - Drive power supply is indicating imminent power failure.<br>UPS* - UPS prohibits energy recovering: Smart DBR required<br>DBR* - Overheat switch of external Smart DBR unit<br>*only visible for **Interface Type** = 1 and **DBR Mode 0-3** > 0 |
| DS DS1 DS2 FLR | DS - State of DS Sensor input<br>DS1 – State of DS1<br>DS2 – State of DS2<br>FLR - Current floor<br>See "TwoStepSpeed 0/1" for more information. |

| | |
|---|---|
| SHK BAT EAR SUS | SHK - Start / Stop shock detection<br>BAT - Battery mode (B_MODE)<br>EAR - Automatic Recovery mode for Earthquake operation<br>SUS - Suspend Failed Drive. This is required for future option with Tandem drive operation, like Skyway drives. |
| RLM RLD BTT BTC | RLM - Relevel mode from MCSS<br>RLD - Relevel mode in DriveState<br>BTT - Toqrue mode of “Brake Maintenance Test”<br>BTC - Brake Torque test Clear flag to next run |
| MOC BOD CZO FAN | MOC - temperature input (0-inactive / 1-active)<br>BOD - Battery Operation mode (0-nomal / 1-Battery mode)<br>CZO - CZ_NO input (0- inactive / 1-active)<br>FAN - command to pick fan relay (0-drop / 1-pick) |
| UDX ETS SSB OEN | UDX - command to UDX relay (0-drop/1-pick)<br>ETS - command to ETSC (0-drop/1-pick)<br>SSB - command to SSB (0-drop/1-pick)<br>OEN - command to PWM output eneble (0-drop/1-pick) |
| SSX SMG SR1 EMG | SSX - Send “S1,S2 Relay check” to MCSS<br>SMG - Sends “Magnet Position Known” to MCSS<br>SR1 - SR1 input 0-inactive / 1-active(picked)<br>EMG - Magnet position error flag with MagErr2 (Refer to F12 MagErr1 MagErr2) |
| AR1/2 CrF CrS | R1/2: The status of AR1 and AR2 contacts where 1 means that ARO initiated via energized the contacts<br>CrF: Charger fault where 1 means faulty charger, flashing means temperature out of range or sensor not connected<br>CrS: Charger Status where 1 means fast charging and flashing bit indicating pre-charge qualification. |
| SLV RCF LV1 LV2 | SLV – DriveSafeToRelevel from GECB ( 1: Relevel Enabled)-<br>RCF – DriveSpeedCheck to GECB ( 1: Relevel Enabled)<br>LV1 - - Door zone 1 sensor<br>LV2 - - Door zone 2 sensor |
| FLR Mid EQAR-R/S | FLR – Current Floor<br>Mid – Middle floor information of hoistway<br>EQAR-R – EQAR Request command from OCSS<br>EQAR-S – EQAR mode Status of Drive |
| RST RSC SPM | RST – DSP Reset command from MCSS<br>RSC –Waiting state during 3 seconds with MCSS Reset Command ( 0-No reset command, 1- DSP reset after 3 seconds)<br>SPM – Single Phase command from MCSS ( 0-3 phase, 1-single phase) |

### 6.3.8 1-6 METRICS

Note: parameters that track since time of installation can be reset by pressing SHIFT-ENTER on the service tool when the parameter is displayed.

| SVT Display | Description |
|---|---|
| ALWA_DISPLAY | **ALWA = Automatic Load Weigh Adjustment**<br>**This display has two alternating displays described below.**<br>**Note: This feature is currently not supported in this release and is available for Engineering test purposes only.**<br><br>**Display 1**<br>**1st line :**<br>Load in car in percent<br>Postload weight at the end of run in percent<br>ALWA Gain in percent<br><br>**2nd line:**<br>ALWA Offset in percent<br>ALWA Error in percent<br><br>**Display 2**<br>**1st line:**<br>"Rbk" – Rollback/rollforward at the beginning of the run in mm.<br>"Cnv" - ALWA Converged (1) or diverged (0).<br><br>**2nd Line:**<br>**ALWA STATE**<br>Displays the current state of ALWA which is one of the following<br>-ALWA_CONVERGED<br>-ALWA_DIVERGED<br>-ALWA_ERROR<br>-ALWA_RESET |
| Flight Time | Flight time of last run (sec).<br>Format: DAYS:HOURS:MIN:SEC:10MSEC. |
| Flight Length mm | Flight length of last run (mm). |
| Number of Runs | Accumulated number of runs since installation. |
| Runs Since Event | Number of runs since the last event was logged. |
| Max AC Main Vrms | Maximum AC mains (Vrms) while PLL locked since installation.<br>If PLL not locked maximum not detected. |
| Max Temp C | Maximum temperature (C) since installation. |
| Max DC Bus V | Maximum DC Bus voltage (V) since installation. |
| Max Motor Arms | Maximum motor current (Arms) since installation. |
| Max Cnv Arms | Maximum converter current (Arms) since installation. |
| Cap Time In Use | Accumulated time the DC Bus has been charged since installation.<br>Format: DAYS:HOURS:MIN. |
| Fan Time In Use | Accumulated time the fan has been running since installation.<br>Format: DAYS:HOURS:MIN. |
| Tot. Time In Use | Accumulated time the drive has been powered since installation.<br>Format: DAYS:HOURS:MIN. |
| Metric E2 Writes | Accumulated number of times metrics have been written to the EEPROM since installation. Metrics written if power fail signal from supply active. |
| Event E2 Writes | Accumulated number of times events have been written to the EEPROM since installation. |

| | |
|---|---|
| Position @pwroff | Position (mm) saved to EEPROM during last power down. This is saved as zero if power down occurs during motion, defined as time between brake lift command and brake dropped with velocity < 10mm/sec.<br>Invalid: 0<br>Valid: 10000.0 to 510000.0 |
| OMU Prohibited | Indicates that the previous run was TCI. Consequently, if the drive is powered-up with an OMU, the OMU software download functions will be prohibited. The "008 OMU Prohibit" fault will be logged. |
| LW % @pwroff | Load value in % imbalance measured at start of last run. |
| Max Enc Cnt | This is the maximum number of iterations that was required to read the encoder with stable signals. If this value is greater than 3, this indicates that there is probably noise on the encoder signals and may indicate an issue with the encoder wiring or grounding. |
| DDP sec | Required for Korean Market.<br>Displays the current value of SVT parameter DDP sec. |
| ARD DDP sec | Required for Korean Market.<br>Displays the current value of SVT parameter ARD DDP sec. |

### 6.3.9 1-7 VANES

| SVT Display | Description |
|---|---|
| SlipMax mm ldg h<br>XXX.X LYYY ZZZ.Z | XXX.X - Maximum slip distance detected [mm]. This value reflects slip after the tolerances for potential other errors have been subtracted! If the measurement never exceeded the level of potential other errors and tolerances, the value shows "---".<br>YYY - Landing number where slip XXX was detected.<br>ZZZ.Z - Rest period in the landing [h] after which slip XXX was detected. |
| SlipRateMax mm/h<br>XX.XX LYYY ZZZ.Z | XX.XX - Maximum slip rate detected [mm/h]. This value reflects slip after the tolerances for potential other errors have been subtracted! If the measurement never exceeded the level of potential other errors and tolerances, the value shows "---".<br>YYY - Landing number where slip rate XX.XX was detected.<br>ZZZ .Z - Rest period in the landing [h] after which slip rate XX.XX was detected. |
| Slip Mitigation<br>XXX YYYYYYYYYY | XXX - Configuration status of belt static slip mitigation feature:<br>ACT: Active<br>LOG: Log only (no reaction triggered by drive)<br>RST: Reset<br>Y…Y - Reaction triggered:<br>**---ok---:** No reaction (no excessive slip)<br>**PHRZZZZZmin:** Phantom runs triggered at interval ZZZZZ min<br>**BLOCKAGE:** Elevator blockage (->GECB) in top landing |
| RestTime now\|max<br>XXXXX YYYYY min | XXX - Time [min] that elevator has rested in the current landing.<br>YYY - Max time [min] that elevator has rested in a landing between NORMAL runs since last feature reset or power up. |
| PrsSpikesFilterd | Number of occurrences where a PRS signal state (=UIS/LV1/LV2/DIS combination) was stable for less than 4 samples and was therefore filtered out from the sequence of valid PRS states. These "spikes" can be due to bouncing, EMI or can regularly occur where the PRS overlaps 2 vanes at the same time (short landings). "PrsSpikesFilterd" is initialized to 1 and is reset at POR. |
| last SpikeLength | Length of last PRS signal state counted in "PrsSpikesFilterd", in samples (1...3, sampling rate 1ms). |

| | |
|---|---|
| lastDeviation | Detected transition pos – expected transition pos [0.1mm], updated for every transition |
| lastCorr @mm/s2 | lastCorrr – Last correction made to pos.fbk, in [0.1mm], updated only when a correction is made (at faster speeds: after last transition of vane, summarizing all deviations)<br>@mm/s2 – Acceleration (encoder) measured at last correction. |
| avgDevInRun | Average of all deviations in ongoing or completed run, in [0.1mm]. |
| avgCorrInRun | Average of all corrections to pos.fbk in ongoing or completed run, in [0.1mm]. |
| maxDevInRun @ldg | Deviation of greatest magnitude in ongoing or completed run, in [0.1mm], together with landing number where it occurred. |
| maxCorInRun @ldg | Correction (pos.fbk) of greatest magnitude in ongoing or completed run, in [0.1mm], together with landing number where it occurred. |
| Offset UIS 0.1mm | Transitions of the UIS sensor at both the upper and lower edges of the vanes had been on average higher than expected from the nominal sensor head geometry |
| Offset 1LV 0.1mm | Transitions of the 1LV sensor at both the upper and lower edges of the vanes had been on average higher than expected from the nominal sensor head geometry |
| Offset 2LV 0.1mm | Transitions of the 2LV sensor at both the upper and lower edges of the vanes had been on average higher than expected from the nominal sensor head geometry |
| Offset DIS 0.1mm | Transitions of the DIS sensor at both the upper and lower edges of the vanes had been on average higher than expected from the nominal sensor head geometry |
| LS1 length mm | Learned length of LS1 magnet during learn run. |
| LS2 length mm | Learned length of LS2 magnet during learn run. |
| LS length min mm | Drive calculated minimum LS length-depends on profile parameters. |
| AHC fault count | **Active only when "AHC Enable 0/1"= 1**<br>The number of faults related to advanced hovering control (AHC) with respect to the top of car encoder signal sent to the machine room drive. |
| AHC Permissive | **Active only when "AHC Enable 0/1"= 1**<br>0 – Advanced Hovering Control is not active during a hovering/releveling run<br>1 – Advanced Hovering Control is active during a hovering/releveling run |
| AHC Pos Delta mm | **Active only when "AHC Enable 0/1"= 1**<br>The difference between the machine encoder and the car encoder if the AHC top of car encoder system is present |
| AHC: Car Mach | Dual Display with Car encoder velocity and Machine encoder velocity<br>Car- Car encoder velocity with magnitude and sign.<br>Mach- Machin encoder velocity with Magnatude and sign. |
| AHC: Kd used | Active only when "AHC Enable 0/1"= 1<br>This is the effective derivative gain (Kd) that is used during Advanced Hovering Control (AHC). The effective Kd = Kd gain * (Kd red factor) * (hoistway position). If the Kd red factor is 0, then the effective Kd is simply equal to the Kd gain SVT parameter. Please see "AHC Kd RedFactor" and "AHC Kd gain". |

### 6.3.10 1-8 ENGINEERING

| SVT Display | Description |
|---|---|
| Test Variable 1 | Test variable used be engineering. |
| Test Variable 2 | Test variable used be engineering. |
| Test Variable 3 | Test variable used be engineering. |
| Test Variable 4 | Test variable used be engineering. |
| Test Variable 5 | Test variable used be engineering. |
| Test Variable 6 | Test variable used be engineering. |
| CPU:Max% Avg% | Max% - maximum CPU utilization.<br>Avg% - average CPU utilization. |
| Tsk 1ms% 10ms% | Tsk 1ms% - Percent utilization of the 1ms task.<br>Tsk 10ms% - Percent utilization of the 10ms task. |
| Cnv% Inv% All% | Cnv% - Percent utilization of the converter task (50 usec max).<br>Inv% - Percent utilization of the inverter and the converter task (100 usec max).<br>All% - Perecent utilization of all high-speed tasks (inverter, converter, and other) and the task schedule (200 usec max). |
| E2 Load Time ms | The amount of time it takes to load all the EEPROM paramaters to RAM. |
| Stack Used Max% | Percent of software stack used. |
| Vel Scale mm/s | Numerical scaling of the velocity in the software. |
| Drv I Scl Rated | Drive current scaling |
| MagPos /LRT eDeg | MagPos – See above.<br>LRT eDeg – Angular offset of the magnets with respect to the encoder in electrical degrees |
| ADC:gain% offset | ADC gain% - ADC gain factor, in percent. It is nominally 100%, and is allowed to vary between 90.4% and 109.6%.<br>ADC offset - ADC offset factor, in counts It is nominally 0, and is allowed to vary between –139 and +139 counts, which is 3.4% of full scale ADC counts.<br>Used to detect the following fault: 707 ADC Offset |
| Reactor I Arms | This is the filtered, average current in the converter and line reactor. The time constant of the filter is 10 minutes for iron-core coils and 0.6 minutes for air-core coils, which is the approximate time constant of the line reactor's thermal response. It is used to determine when the fan should be fully turned-on to cool the line reactor. The threshold for the fan is 90% of the line reactor continuous rated current. |
| Inert used kg-m2 | This display variable is the actual inertia used when the load in the car changes. This is valid when the load weighing type is 1 (Load Weigh Type) and there is valid load weighing information. The inertia used can not be more than +/-20% of the contract inertia Inertia kg-m2 |
| mm @accumEncPls | Shows the mm position corresponding to the accumulated encoder pulse count. This display/count can be reset to zero (SHIFT-ENTER) anywhere and shows sheave position relative to the reset point, i.e. without including pos fbk correction steps. |
| Vel Reg Hz | The actual rate of the velocity regulator task in Hz. |
| Cnv Reg Hz | The actual rate of the converter regulator task in Hz. |
| VTE Parameters<br>AAA BBB CCC DDD% | Current status of Vane Transition Estimator (VTE) parameters identified by adaptive algorithm: For vane exit <5min after entry, Normal runs only.<br>AAA - [0.1mm] Hysteresis (nominal to actual, not on to off)<br>BBB - [0.1mm/m] Rope stretch for car load change 100%DL<br>CCC - [0.1mm] Hitch spring compression for car load change 100%DL<br>DDD - [%] ratio EmptyCarWeight/DutyLoad |

| | |
|---|---|
| VTE Dtbc:est mea<br>XXX.X YYY.Ymm | XXX - Last estimated disturbance: estimated vane exit pos vs. nominal.<br>YYY - Last measured disturbance: detected vane exit pos vs. nominal. |
| VTE Dbc:HyAcLgLd<br>AAA BBB CCC DDDD | Last estimated disturbance components: estimated - nominal<br>AAA - [0.1mm] Hysteresis (nominal to actual, not on to off)<br>BBB - [0.1mm] Accel effects (stretch+hitch)<br>CCC - [0.1mm] Lag effect<br>DDD - [0.1mm] Load change effect (stretch+hitch) |
| VTE MaxDevFrmNom<br>M: XXX.X YYY.Ymm | M - Maturity level of Vane Transition Estimator (VTE) corresponding to XXX, YYY<br>XXX - Max deviation (nominal exit - measured exit mm-position).<br>YYY - Residual error of VTE corresponding to XXX<br>(estimated exit - measured exit mm-position). |
| VTE MaxResidl SE<br>M: XXX.X YYY.Ymm | M - Current maturity level of Vane Transition Estimator (VTE),<br>corresponding to max residual errors XXX, YYY<br>XXX - Max residual error of VTE in UP direction at same edge<br>(estimated exit > measured exit mm-position).<br>YYY - Max residual error of VTE in DOWN direction at same edge<br>(estimated exit < measured exit mm-position). |
| VTE MaxResidl OE<br>M: XXX.X YYY.Ymm | M - Current maturity level of Vane Transition Estimator (VTE),<br>corresponding to max residual errors XXX, YYY<br>XXX - Max residual error of VTE in UP direction at opposite edge<br>(estimated exit > measured exit mm-position).<br>YYY - Max residual error of VTE in DOWN direction at opposite edge<br>(estimated exit < measured exit mm-position). |
| BSLP 3Margin mm<br>AAA BBB CCC DDDD | Remaining margin before triggering belt slip phantom runs:<br>Overall_Margin-abs(expected-measured)<br>Positive values indicate no slip, negative are detected as slip.<br>AAA - [mm] Remaining margin at largest deviation<br>abs(expected-measured exit pos).<br>BBB - [mm] (Next) smallest remaining margin.<br>CCC - [mm] Remaining margin at (next) highest slip rate.<br>DDD - [mm] Overall_Margin at AAA |

## 6.4 Event Log

### 6.4.1 General Description

All events detected by the drive software, except for those that are masked out via parameters "MaskOut Warning1" and "MaskOut Warning2", are stored in an event log that is accessible through the service tool. There are two event logs: the *current* log contains information about events which have been detected since the most recent POR, and the *saved* log which is the EEPROM backup of the events from before the most recent POR.

- If "MaskOut Warning1" is non-zero, the event log displays "Filter is on!" as its first entry to indicate that some events are masked out of the event log.
- Both the *current* log and the *saved* log have the same format. Each entry in the log contains the event code, the name of the event, and the elapsed time since POR that the event was detected:

```
705 E2 Invalid
0000:00:00:00.04
```

  The time is in the format: DDDD:HH:MM:SS.SS.
- Enter **menu 2-1** to access the *current* log, events that have occurred since the most recent POR.
- Enter **menu 2-2** to access the *saved* log, events that occurred before the most recent POR.
- Enter **menu 2-3** to clear the *current* event log.

```
Clear Log?
Enter to clear.
```

  Hit SHIFT-ENTER to clear.

- Enter **menu 2-4** to clear a blockage of the drive that occurs when certain events are detected.

### 6.4.2 Event-Specific Data

When viewing an event, event-specific data can be accessed by using the following service tool keys:

| Key Sequence | Description | Example: Before Key Sequence | Example: After Key Sequence |
|---|---|---|---|
| SHIFT-ENTER | Navigates *down* one level in the event tree to access event-specific data. | `Power On`<br>`0000:00:00:00.04` | `Drive State @Evt`<br>`IDLE` |
| | If the fault is: `705 E2 Invalid` | `705 E2 Invalid`<br>`0000:00:00:00.04` | `Go to XX`<br>`Invalid Param` |
| GO ON | Scrolls *forward* through event-specific data. | `Drive State @Evt`<br>`IDLE` | `Number of Runs`<br>`12` |
| GO ON | Scrolls *forward* through event-specific data. | `Number of Runs`<br>`12` | `Event Response`<br>`Emergency Stop` |
| SHIFT–GO BACK | Scrolls in *reverse* through event-specific data. | `Event Response`<br>`Emergency Stop` | `Number of Runs`<br>`12` |
| CLEAR | Navigates *up* one level in the event tree. | `Number of Runs`<br>`12` | `Power On`<br>`0000:00:00:00.04` |

Event-specific data that is available is shown in the table:

| Service Tool Display | Description |
|---|---|
| `Drive State @Evt`<br>`IDLE` | This shows the state of the drive when the event was logged. Note that this is the state when the event is logged rather than the state when the event is detected. |
| `Number of Runs`<br>`12` | This counter is incremented if the last run had no events logged other than “001 New Run”. |
| `Event Response`<br>`Emergency Stop` | The response of the drive when the event was detected. |
| `Event Count:`<br>`12` | The number of times the fault was logged since the event log was cleared. The counter is incremented each time the fault is logged. Note, the counter is incremented (and event logged) only once in a run even if the event is detected multiple times during this run. Also, the counter is incremented at event detection event if that event is masked out of the event log via parameters “`MaskOut Warning1`” or “`MaskOut Warning2`”.<br>1. This count is different from the occurrence count that is used to block the drive. See section 6.4.3 for a description of the occurrence counters that cause blocking.<br>2. The event counters and logs are cleared via M26.<br>3. The event count is not cleared at POR. |

***The following information is available under Interface type:***
1 – CAN Interface, TCBC or GCS, profile generator in drive:

| Service Tool Display | Description |
|---|---|
| `Drive State @Evt IDLE` | This shows the state of the drive when the event was logged. Note that this is the state when the event is logged rather than the state when the event is detected. |
| `Number of Runs 12` | This counter is incremented if the last run had no events logged other than “001 New Run”. |
| `Event Response Emergency Stop` | The response of the drive when the event was detected. |
| `Event Count: 12` | The number of times the fault was logged since the event log was cleared. The counter is incremented each time the fault is logged. Note, the counter is incremented (and event logged) only once in a run even if the event is detected multiple times during this run.<br>1. This count is different from the occurrence count that is used to block the drive. See section 6.4.3 for a description of the occurrence counters that cause blocking.<br>2. The event counters and logs are cleared via M26.<br>3. The event count is not cleared at POR. |
| `Drive Sub State 12` | This shows the sub state of the drive when the event was logged. Refer to section 7 for substate value and definition |
| `velocity mm/s 0` | This shows the velocity at which the motor was running while the event was logged |
| `Position 0.1mm 0` | This shows the position of the car in 0.1mm resolution when the fault was logged |
| `CanRun Mode NO_RUN` | This shows the CAN run mode in which the fault was logged |
| `Current Floor 255` | This shows the current floor position when the fault was logged |

## 6.4.3 Shut Down Error Handling

Some error events cause a shut-down (immediate stop) with an additional inverter blockage immediately or after repeated occurrences in sequence. In case of an inverter blockage, the DC – link will be disconnected from the mains supply.

**WARNING! Before starting the drive again, the error reason must be found and solved. Otherwise, the inverter can be seriously damaged.**

In case of blockage, do the following:

1. Establish service tool connection to the drive.
2. Find out the reason that caused the blockage by viewing the event log **menu 2-1**.
3. Clear the blockage by going to **menu 2-4** and following the prompt:

```
Clear Block?
Enter to clear.
```

Hit SHIFT-ENTER to clear.

- Some errors cause blockage only as long as the failure is still present, e.g., if an over heat occurs then the drive is allowed to do runs again as soon as the drive has cooled down. See the event descriptions in Section 6.4.8 for further details.

## 6.4.4 Occurrence Counters

As stated above, some errors have an internal counter that is incremented every time that error occurs in succession. When the counter has reached a limit, the drive will block itself. The specific errors that have such counters and the corresponding limits are indicated in the detailed event descriptions in Section 6.4.8. For example, “E4” means that 4 occurrences in series lead to a drive blockage.

**Applicability**

- The counters are applicable only when the drive is in CAN mode (Interface Type = 1). They are *not* applicable when the drive is in MCSS mode.
- The counters are *not* applicable during TCI and ERO runs; all the counters are reset to zero when the car is set to TCI or ERO.

**Clearing of Occurrence Counters**

The occurrence counters are cleared automatically after several consecutive runs without error. The detail action taken is:

- Two successful runs without error are required before any counters are decremented. After two successful runs, *all* the counters are decremented by one for each successful run. The only exceptions to this are for the events “512 Missing Vane” and “513 No PRS Trans”. For these two events, *five* successful runs without error are required before these counters are decremented (this is so because these faults result in correction runs, but these faults are not checked during correction runs).

The occurrence counters are manually cleared by any of the following actions:

- The car is placed on TCI or ERO.
- Clear Blockage, **menu 2-4**
- Software reset, **menu 2-5**.
- POR

## 6.4.5 Software Reset

The DSP on the control board can be reset through service tool commands. This is intended to be used when performing software upgrades to the control board.

The reset is accessed in **menu 2-5**. A confirmation is required:

```
Reset DSP?
Enter to reset.
```

Hit SHIFT-ENTER to reset.

Note, the reset is only allowed when the drive is in the IDLE state or less.

### 6.4.6 Event Response

Every event detected by the drive has a defined response, which is summarized in Table below.

| Event Response | Abbrev -iation | Description |
|---|---|---|
| **INFO** | **I** | The event is logged for information only and no action is taken by the drive. |
| **WARN** | **W** | The event is logged for warning only and limited or no action is taken by the drive. |
| **COMP** | **C** | The event is logged, the run is allowed to complete, and the drive enters the **ShutDown** state. The drive sets the Stop-an-Shutdown (**SAS**) flag until the fault condition clears.<br>• In CAN mode, the drive will NOT attempt another run until the fault condition clears.<br>• In MCSS mode, the drive will attempt another run if requested by the controller, except for thermal faults. |
| **NEXT-COMMITTABLE** | **NC** | **This response is applicable only for CAN–type controllers during normal runs.**<br>• The event is logged and the target is changed to the next committable.<br>• PRS+LS signals are ignored for position corrections.<br>• The drive sets the stop and shutdown (**SAS**) flag until the fault condition clears.<br>• The run to the next committable will continue only if the fault is determined to be triggered by a failure of the GECB, a failure "both LS active" or a failure of the CAN communications. This is determined by checking if a follow-up event event "`511 1LS & 2LS !`" was also logged or the CAN message "DrHwySignals" has timed out (=event "`906 No LS Msg`"). Otherwise, the fault response will transition to a timed decel (**DECEL**).<br>• When the run ends, the drive passes through **SHUTDOWN** and position is invalidated.<br>**During other run modes than NORMAL, the fault reaction is an immediate timed deceleration (DECEL).** |
| **DECEL** | **D** | **This response is applicable only for CAN–type controllers.**<br>The event is logged, the run is terminated with a timed decel, and the drive enters the **ShutDown** state. The deceleration rate is 105% of contract deceleration rate with a minimum of 0.5 m/sec^2.<br>• The drive remains in the **ShutDown** state until the fault condition clears. The drive will NOT attempt another run until the fault condition clears.<br>• For momentary faults, the fault is automatically cleared after the sheave has stopped, subject to a minimum 250 ms. |
| **ESTOP** | **E** | The event is logged and the run is immediately terminated by the drive.<br>• In CAN mode, The drive enters the **ShutDown** state for certain faults. It remains in this state until the fault clears, the sheave has stopped, and a minimum of 100ms. Some faults will set the Stop-an-Shutdown **(SAS)** flag. The drive will NOT attempt another run until the fault condition clears.<br>• In MCSS mode, the drive will attempt another run if requested by the controller.<br>• When the estop was caused by a command to stop or by the safety chain opening, the drive enters **Wait for Safety** state.<br>• In either case, if the fault was not a converter-related fault, the converter will remain active until the sheave has stopped. |

| | | |
|---|---|---|
| **SERVICE** | **S** | The event is logged, the run is immediately terminated by the drive, and the drive enters the **Power Down** state. The drive sets the Stop-an-Shutdown (**SAS**) flag. The drive is blocked from further runs. A power on reset (POR) is required for the drive to recover from this condition or must be reset through the service tool menu 2-4. |
| **ENDRUN** | **ER** | **This response is applicable only for CAN–type controllers.**<br>The event is logged, the run or brake lift is aborted using a normal deceleration profile (jerk-in/out), and the drive does not enter the **ShutDown** state. |
| **ENDRUN + SHD** | **ERS** | **This response is applicable only for CAN–type controllers.**<br>The event is logged, the run or brake lift is aborted using a normal deceleration profile (jerk-in/out), and the drive enters the **ShutDown** state.<br>• The drive remains in the **ShutDown** state until the fault condition clears. The drive will NOT attempt another run until the fault condition clears.<br>• For momentary faults, the fault is automatically cleared after the sheave has stopped and a minimum of 250 ms time. |

## 6.4.7 Event Overview

| **Information Events** |
|---|
| 000 Power On |
| 001 New Run |
| 002 SPARE |
| 003 Stack Warn |
| 004 Power Down |
| 005 Extern FLASH |
| 006 Extern RAM |
| 007 OMU Present |
| 008 OMU Prohibit |
| 009 Manual Mode |
| 010 B_MODE |
| 011 Battery Mode |
| 012 LearnRun REQ |
| 013 Reset DSP |
| 014 Clear Log |
| 015 AutoTun Mode |
| 016 Earthquake |
| 017 Block Cleard |
| 018 ALWA CONVRGD |
| 019 ALWA ERROR |
| 020 ALWA RESET |
| 021 ALWA DIVERGD |
| 022 EQAR Clear |
| 023 ARO Hlth Chk |
| 024 ARO Active |
| 025 ARU Type Mis |
| 026 UCM-EN clear |
| 027 Temp is 0 |
| 028 Download En |
| 029 Balance Err |
| 030 MotorRun Err |
| 031 SlipFtrReset |
| 032 SlipPhanRuns |
| 033 SlipBlockage |
| 034 SlipDownwrds |
| 035 SSO Active |
| 036 SSO Success |
| 037 SlipOutOfDz |
| 038 SlipDirUnclr |
| 039 RemoteRstCmd |
| 040 StartTimeout |
| 041 Estop Requst |
| **Self Commissioning Events** |
| 050 KP negative |
| 051 KP not conv |
| 052 KI negative |
| 053 KI not conv |
| 054 LSIG negativ |

| 055 RTCr negativ |
|---|
| 056 RTCr not cnv |
| 057 SWEEP negatv |
| 058 RTC negative |
| 059 RTC is zero |
| 060 RTC negative |
| 061 RTC not conv |
| 062 ID&V diverge |
| 063 NO Op Point |
| 064 Imag>drv Rtd |
| 065 Wrong direct |
| 066 PTR Timeout |
| 067 Car nt empty |
| 068 FT RTC !conv |
| 069 FT not conv |
| 070 FT ID ! conv |
| 071 FT Itq !comp |
| 072 Ineria !conv |
| 073 Run too shrt |
| 074 Drive Fault |
| 075 Drive SAS |
| 076 ID/IQ divrge |
| 077 RTCr Real<0 |
| 079 Kp RTR Fault |
| 080 LearnRun SVT |
| **Inverter Current Faults** |
| 100 Inv SW Oct |
| 101 Inv I Imbal |
| 102 Inv Id Error |
| 103 Inv Iq Error |
| 104 Inv Ix Offst |
| 105 Inv Iy Offst |
| 106 Inv Iz Offst |
| 107 Inv Gate Flt |
| 108 Inv HW Oct |
| 109 Overload |
| 110 Drive Limit |
| 111 No Id fdbk |
| 112 No Iq fdbk |
| 113 Inv IPM Flt |
| 114 Curr Ovrload |
| 115 Brk Chop Err |
| 116 Inv HW Ovt |
| 117 Inv Pfai Flt |
| 118 Overload Dec |
| 119 Desat Err |
| 120 Output Cur |
| 121 SR1 Err |
| 122 Inv DeSat |

| 123 CnvOverload |
|---|
| **Converter Current** Faults |
| 200 Cnv SW Oct |
| 201 Cnv Id Error |
| 202 Cnv Iq Error |
| 203 Cnv Ix Offst |
| 204 Cnv Iy Offst |
| 205 Cnv Gate Flt |
| 206 Cnv HW Oct |
| 207 Cnv Gnd Flt |
| 208 Bus Cap Fail |
| 209 DC Link OCT |
| 210 Cnv IPM Flt |
| 211 Battry Chrgd |
| 212 Cnv Vmag Flt |
| 213 Cnv I Imbal |
| 214 Cnv DeSat |
| **Voltage** Faults |
| 300 DC Bus Over |
| 301 DC Bus Under |
| 302 VAC Over |
| 303 VAC Under |
| 304 VAC Imbal |
| 305 PLL Unlock |
| 306 Single Phase |
| 307 PLL Freq Rng |
| 308 Welded Mx/Px |
| 309 Vscales off |
| 310 AC Brown-out |
| 311 AC All Err |
| 312 DBTR ShrtErr |
| 313 AC/DC Calib |
| 314 Cnv Res FltV |
| 315 Cnv Res FltF |
| 316 BatOverVolt1 |
| 317 BatUnderVolt |
| 318 OCBT Under |
| 319 Cnv i imbal |
| 320 CNV NBus Flt |
| 321 INV NBus Flt |
| 322 NBus OverFlt |
| 323 SSO OverVolt |
| 324 SSOAcLineFlt |
| 325 NoAc-HighPwr |
| 326 Hybrid-DcFlt |
| **Brake** Faults |
| 400 Brake S1 SAS |
| 401 Brake S2 SAS |
| 402 Brake Status |

| 403 Brake BY |
|---|
| 404 Brake I Off |
| 405 Brake I Drop |
| 406 Brake I Hold |
| 407 Brake I Max |
| 408 Brk S1 ESTOP |
| 409 Brk S2 ESTOP |
| 410 Low Speed |
| 411 Brk S1 DECEL |
| 412 Brk S2 DECEL |
| 413 Bk Desat Err |
| 414 Bk Bus Over |
| 415 Bk Bus Under |
| 416 Bk fbk tmout |
| 417 Bk SW Oct |
| 418 Bk lft tmout |
| 419 Bk drp tmout |
| 420 Bk Dly DetW |
| 421 Bk Dly DecE |
| 422 Brk ShrtCrkt |
| 423 Brk I State |
| 424 Brake I Neg |
| 425 Hyd Pump Flt |
| 426 BTI NG LOCK |
| 427 Chk Man BTI |
| 428 Brk S3 DECEL |
| 429 Brk S4 DECEL |
| 430 Brk S5 DECEL |
| 431 Brk S3 ESTOP |
| 432 Brk S4 ESTOP |
| 433 Brk S5 ESTOP |
| 434 Brake S3 SAS |
| 435 Brake S4 SAS |
| 436 Brake S5 SAS |
| 437 Bk UCM Relay |
| 438 Brk Cur Undr |
| **Motion** Faults |
| 500 Overspeed |
| 501 Pos Tracking |
| 502 Vel Tracking |
| 503 LRT Motion |
| 504 Enc Pos Err |
| 505 SPARE |
| 506 Stopping Err |
| 507 Pos at 1LS |
| 508 Pos at 2LS |
| 509 Floor at 1LS |
| 510 Floor at 2LS |
| 511 1LS & 2LS ! |
| 512 Missing Vane |

| |
|---|
| 513 No PRS Trans |
| 514 Enc <> Vane |
| 515 NTSD failed |
| 516 Corr failed |
| 517 DDP Error |
| 518 BeltCmp Wrng |
| 519 RlvPermitErr |
| 520 Rllbck Start |
| 521 Rllbck Stop |
| 522 ManualRescue |
| 523 Moved at POF |
| 524 No Enc Signl |
| 525 NoRlv SpdChk |
| 526 NoRlv TooMny |
| 527 NoRlv LostDZ |
| 528 Profile Err |
| 529 No enc fdbck |
| 530 No enc tmout |
| 531 PRS Sigs 1LS |
| 532 PRS Sigs 2LS |
| 533 ARO Overspd |
| 534 ABL Abort:LW |
| 535 Timeout PTR |
| 536 Timeout LB |
| 537 No EndRunCmd |
| 538 Abort:EndRun |
| 539 LvTransUnclr |
| 540 Shock Detect |
| 541 SinCos Warng |
| 542 Decel Req Fl |
| 543 SSOoverSpeed |
| 544 Torq Obs Flt |
| 545 Car Pos Err |
| 546 Car Vel Err |
| 547 CarEncErr NR |
| 548 CarEncErr LR |
| 549 AHC Enc/Vane |
| 550 Crp Time Low |
| 551 CrpSpe Boost |
| 552 CrpSpe inval |
| 553 DZ at Decel |
| 554 DZ lost Stop |
| 555 DZ too late |
| 556 APRS step |
| 557 130% Mtr Frq |
| 558 150% Mtr Frq |
| 559 Enc Nois Flt |
| 560 APB Detected |
| **Temperature** Faults |
| 600 Inv Tmp Warn |
| 601 Inv Tmp Over |
| 602 Inv Tmp Fail |

| |
|---|
| 603 Cnv Tmp Warn |
| 604 Cnv Tmp Over |
| 605 Cnv Tmp Fail |
| 606 Mtr Tmp Over |
| 607 Reactor Temp |
| 608 DBR Tmp Over |
| 609 AC/DC Calibr |
| 610 Batt Ovr Tmp |
| 611 MTC/RTC Flt |
| 612 Inv IGBT tmp |
| 613 HSl Tmp Warn |
| 614 HSl Tmp Over |
| 615 HSl Tmp Fail |
| 616 HSu Tmp Warn |
| 617 HSu Tmp Over |
| 618 HSu Tmp Fail |
| **State** Faults |
| 700 Safety Chain |
| 701 No Man Input |
| 702 Prechrg Time |
| 703 S Rly Fault |
| 704 DBD Fault |
| 705 E2 Invalid |
| 706 E2 Write Lim |
| 707 ADC Offset |
| 708 Cmd to Abort |
| 709 PRS SigNoise |
| 710 UIB DIB Err |
| 711 DBD Shutdown |
| 712 PostTrq Time |
| 713 Block by xxx |
| 714 B_MODE Err |
| 715 ARO BatPower |
| 716 Illegal Cmd |
| 717 Triac Stuck |
| 718 PRS Config |
| 719 OARO Blocked |
| 720 Welded BLV |
| 721 PwmExistsFlt |
| 722 E2 Read CkSm |
| 723 UCM in Run |
| 724 UCM in Slide |
| 725 UCM BrkBlock |
| 726 Tmout SfcMsg |
| 727 TOStp SfcMsg |
| 728 Slack Rope |
| 729 SysTrip OCBT |
| 730 S2 RlyFault |
| 731 PX RlyFault |
| 732 MX RlyFault |
| 733 No Q4 Reset |
| 750 ARU Failure |

| |
|---|
| 751 Dischrg Batt |
| 752 Bat Chrg Flt |
| 760 Missing Batt |
| 761 Batt Tmp Flt |
| 762 Batt Flt |
| 763 Welded ARx |
| 764 ARO Alarm CR |
| 765 LVD Prechrg |
| 770 24VsupplyFlt |
| 771 VintSuplyFlt |
| 772 Prechrg Fail |
| **Task Overrun** Faults |
| 800 1ms Task |
| 801 10ms Task |
| 802 40ms Task |
| 803 Cnv Task |
| 804 Inv Task |
| 805 200ms Task |
| 806 Illegal Pwm |
| **Communication Faults** |
| 900 MCSS Timeout |
| 901 SVC Tool Err |
| 902 CAN Err |
| 903 E2 CommWrite |
| 904 LWSS Timeout |
| 905 LWSS Bad Val |
| 906 No LS Msg |
| 907 Primary CRC |
| 908 Drive CRC |
| 909 CAN BusOff |
| 910 CAN OPB_Init |
| 911 CAN TxQ Full |
| 912 No FloorInfo |
| 913 MCSS Warning |
| 914 Power E2 Err |
| 915 LWSS not cal |
| 916 Power E2 Rng |
| 917 CPLD Ver Flt |
| 918 ARO Ver Flt |
| 919 Powrbrd miss |
| 920 Micro ChkSum |
| 921 FPGA ChkSum |
| 922 FLASH Warn |
| 923 FPGA Warn |
| 924 Micro War |
| 925 No CAN-PRS |
| 926 CAN PRS Msg |
| 927 DSP2FPGA Wrn |
| 928 DSP2FPGA Flt |
| 929 UCMP Timeout |
| 930 PRS TrnsSkip |

| |
|---|
| 931 Micro VerFlt |
| 932 SBSB Fault |
| 933 PosTimeStamp |
| 934 APRS timeout |
| 935 AHC comm flt |
| 936 FloorTabCnfl |
| 937 FloorTabPubl |
| 938 FT TopBotBad |
| 939 FT E2 writes |
| 940 FT CRC bad |
| 950 Tandem Warm |
| 951 Tandem Comm |
| 952 Drv x Comm |
| 953 Drv x Estop |
| 954 Drv x SAS |
| 955 Drv x Temp |
| 956 Drv x Warn |
| 957 Drv x Block |
| 958 Drv x Limit |
| 959 DisInfo Miss |
| 960 SF Write Lim |

### 6.4.8 Event Menu Detailed Descriptions

The following list includes all events detected.

Column 1: The name of the event, including the event code

Column 2: The response to the event, followed by the number of occurrences in series that leads to a drive blockage (see Section 6.4.3).

Column 3: A description of the event including possible causes and potential solutions.

### 6.4.9 Information Events

| SVT Display | | Description |
|---|---|---|
| 000 Power On | I | Power was applied to the drive. |
| 001 New Run | I | A new run was initiated. |
| 002 SPARE | I | Not used. |
| 003 Stack Warn | W | The stack usage has exceeded an acceptable limit. |
| 004 Power Down | I | The power fail signal in the hardware was activated.<br>*Maskable via parameters "MaskOut Warning1" and 2.* |
| 005 Extern FLASH | W | The GDCB FLASH memory has failed. |
| 006 Extern RAM | W | The GDCB RAM memory has failed. |
| 007 OMU Present | I | Indicates that a valid OMU is plugged into the drive OMU port at power-up. |
| 008 OMU Prohibit | I | Indicates that an OMU software upgrade is prohibited because the previous run was TCI. The status of the permissive can be viewed in the SVT parameter OMU Prohibited.<br><br>Solution<br>If this fault occurs, it can be cleared by performing an ERO run (the ERO run confirms that the mechanic is in the hallway). |
| 009 Manual Mode | I | Indicates that the drive is in Manual Mode. |
| 010 B_MODE | I | **Applicable only when Interface Type = 2 or 3.**<br>**Applicable only when "ARO Type" = 2 or 3.**<br>Logged when the drive received "B_MODE signal" from Battery controller. |
| 011 Battery Mode | I | **Applicable only when Interface Type = 1.**<br>Indicates the drive is in battery (ARO-EN) mode operating on 48Vdc battery supply. Logged when the drive received SpbMode message "BatteryMode" from SPBC3. |
| 012 LearnRun REQ | I | **Applicable only when Interface Type = 1.**<br>Indicates that the floor table in the drive is invalid and that a new learn run is required. |
| 013 Reset DSP | I | The DSP was reset using the SVT menu 2-5. |
| 014 Clear Log | I | The event log was cleared using SVT menu 2-3. |
| 015 AutoTun Mode | I | The drive is in Auto Tune mode. |
| 016 Earthquake | \| | **Applicable only for "JIS Function 0/1" = 1**<br>Indicates earthquake detection. This mode is initiated by the recovery signal from MCSS. In this mode, shock detection and the torque pulsation detection are activated. |
| 017 Block Cleard | I | Indicates that a blockage condition was cleared either via the service tool menu or by a CAN message. |
| 018 ALWA CONVRGD | I | Indicates that ALWA has converged with a fixed gain and offset. |
| 019 ALWA ERROR | I | Indicates that ALWA has an algorithmic error. |
| 020 ALWA RESET | I | Indiactes either an automatic reset by the algorithm or through the service tool was done. This resets the gain and the offset to 1 and 0 respectively. |
| 021 ALWA DIVERGD | I | Indicates that the ALWA algorithm has not converged. |
| 022 EQAR Clear | I | **Applicable only for "JIS Function 0/1" = 1**<br>EQAR mode was cleared by clear command. |

| | | |
|---|---|---|
| 023 ARO Hlth Chk | I | The drive has received an ARO Health check request either from the MCSS or from SVT M455 “Opt ARO Test 5-5”. If the drive accepts the request, it will log “024 ARO Active”, and attempt to perform the health check. The request is only accepted while in IDLE and no ARO faults. |
| 024 ARO Active | I | The drive accepts the request, and logs “024 ARO Active”, and attempts to perform the ARO health check. |
| 025 ARU Type Mis | I | The wrong ARU type was selected during installation. Specifically, “ARO Release? 1/2“ was set to1 , but type 2 hardware is present. The check is done only when starting ARO operation.<br>Check the settings of the following parameters:<br>Interface Type Should be 3 for NSAA ARU<br>ARO Type Should be 4 for NSAA ARU<br>ARO Release? 1/2 Should be 1 for ARU1 or 2 for ARU2 |
| 026 UCM-EN clear | I | **Applicable only when Interface Type = 1.**<br>Indicates that a blockage according to 723 UCM in Run, 724 UCM in Slide or 725 UCM BrkBlock has been cleared. . |
| 027 Temp is 0 | I | **Applicable only when Drive Type is 416G drive.**<br>The detection temperature generates an event at less than 1 ℃.<br>When the thermistor circuit is opened, the drive outputs the same event. |
| 028 Download En | I | This event indicates the parameter download mode has been enabled. |
| 029 Balance Err | I | **Applicable only when Check Unbalance= 1.**<br>The drive calculate “unbalance torque” during down running in car no load.<br>The detection unbalance torque generates an event at less than +/- 10%. |
| 030 MotorRun Err | I | **Applicable only when Self BTI Block =0.**<br>The detection speed generates an event at more than zero speed. |
| 031 SlipFtrReset | W | Static Slip Mitigation feature was reset. |
| 032 SlipPhanRuns | W | Static Slip upwards was detected and phantom runs were requested from the GECB. This event is logged again only when the requested phantom run interval decreases, i.e. higher slip was detected. |
| 033 SlipBlockage | W | Static Slip upwards was detected in excess of 50mm or of 10mm/h => a system blockage was requested. |
| 034 SlipDownwrds | W | Static Slip was detected in downward direction. |
| 035 SSO Active | I | Reserved |
| 036 SSO Success | I | Reserved |
| 037 SlipOutOfDz | W | Static Slip was detected due to 1LV leaving the vane while the brake was dropped. |
| 038 SlipDirUnclr | W | The direction of the Static Slip was not detected conclusively (1sensor & brake dropped & imbalance<30%) => closer edge was assumed. |
| 039 RemoteRstCmd | I | This information is reset command from MCSS. If drive receive the reset command, the Drive will automatically reset after 3 seconds. |
| 040 StartTimeout | W | Start timeout of rescue run or correction run. Position is invalidated. |
| 041 Estop Requst | E | RESERVED |

## 6.4.10 Self Commissioning Events

| SVT Display | | Description |
|---|---|---|
| 050 KP negative | E | Either the voltage or current was zero or negative during the KP test. |
| 051 KP not conv | E | The KP test did not converge within the iteration limit. |
| 052 KI negative | E | Either the voltage or current was zero or negative during the KI test. |
| 053 KI not conv | E | The KI test did not converge within the iteration limit. |
| 054 LSIG negativ | E | Either the voltage or current was zero or negative during the LSIG test. |
| 055 RTCr negativ | E | Either the voltage or current was zero or negative during the RTC REAL test. |
| 056 RTCr not cnv | E | The RTC REAL test did not converge within the iteration limit. |
| 057 SWEEP negatv | E | Either the voltage or current was zero or negative during the SWEEP test. |
| 058 RTC negative | E | Either the voltage or current was zero or negative during the RTC test. |
| 059 RTC is zero | E | The RTC could not be computed due to zero result during the RTC IMAG INIT test. |
| 060 RTC negative | E | Either the voltage or current was zero or negative during the RTC IMAG COMPUTE test. |
| 061 RTC not conv | E | The RTC IMAG COMPUTE test did not converge. |
| 062 ID&V diverge | E | The IMAG and ITORQ test diverged. |
| 063 NO Op Point | E | The IMAG and ITORQ test did not converge within the iteration limit. |
| 064 Imag>drv Rtd | E | The IMAG result exceeded the rated drive current. |
| 065 Wrong direct | E | The car is running in the wrong direction required by the test. |
| 066 PTR Timeout | E | The test timed-out waiting for PTR. |
| 067 Car nt empty | E | The car is not empty as required by the test. |
| 068 FT RTC !conv | E | The fine tune RTC test (RTC inner loop) did not converge within the iteration limit. |
| 069 FT not conv | E | The fine tune RTC test (main outer loop) did not converge within the iteration limit. |
| 070 FT ID ! conv | E | The fine tune RTC test (IMAG inner loop) did not converge within the iteration limit. |
| 071 FT Itq !comp | E | The fine tune RTC I torque computation failed. |
| 072 Ineria !conv | E | The INERTIA test did not converge within the iteration limit. |
| 073 Run too shrt | E | The run length was too short; did not meet minimum run length required by the test. |
| 074 Drive Fault | E | A drive fault occurred during the self commisioning test. |
| 075 Drive SAS | E | A drive stop and shutdown occurred during the self commisioning test. |
| 076 ID/IQ divrge | - | RESERVED |
| 077 RTCr Real<0 | W | The real impedence was negative during the RTCr test. |
| 079 Kp RTR Fault | E | The KP test timed-out waiting for PTR. |
| 080 LearnRun SVT | I | Not supported |

## 6.4.11 Inverter Current Faults

| SVT Display | | Description |
|---|---|---|
| 100 Inv SW Oct | E4 | The magnitude of the inverter current exceeded an allowed threshold.<br><br>Possible Causes & Solutions<br>• Incorrect motor phasing → change parameter Motor Phase 0/1.<br>• Shorted motor phase → check motor wiring continuity.<br>• The fault threshold can be temporarily adjusted by the parameter Inv I Limit %.<br>**Applicable when Interface Type = 0 or 1:**<br>OCT(A) = Drive I fullscale * Inv I Limit %* 0.9 * 1.05<br>(Drive I fullscale: 402→ 80A 404→110A)<br>**Applicable when Interface Type = 2 or 3:**<br>OCT(A) = Drive I fullscale * Inv I Limit %* 0.9 * 1.25 |
| 101 Inv I Imbal | E4 | The sum of the three motor currents exceeded 10% full-scale current.<br><br>Possible Causes & Solutions<br>• Ground fault → check there are no motor phases shorted to ground.<br>• Signal noise → check that wiring guidelines are followed. |
| 102 Inv Id Error<br>103 Inv Iq Error | E4 | The indicated inverter current regulator error exceeded an allowable threshold.<br><br>Possible Causes & Solutions<br>• Current regulators are not tuned correctly → check proper motor parameter settings (see Section 9). |
| 104 Inv Ix Offst<br>105 Inv Iy Offst<br>106 Inv Iz Offst | E | The indicated inverter phase current offset exceeded 5% of full-scale.<br><br>Possible Causes & Solutions<br>• Defective circuit → change drive package (if occurs permanently). |
| 107 Inv Gate Flt | E4 | **NOT applicable when Drive Type is 25A.**<br>An inverter IGBT gate supply voltage fault was detected (inverter PF_IGBT signal on most drives).<br><br>Possible Causes & Solutions<br>• Defective or shorted gate power supply → change drive package (if occurs permanently). |

| | | |
|---|---|---|
| 108 Inv HW Oct | E4 | **NOT applicable when Drive Type is 25A.**<br>For 60A V.2 – drives:<br>The power section has detected a fault and set the discrete input (ERR1/INV_FLT: P1-12 ) to the GDCB. Because this input is shared by both HW Overcurrent and HW Overvoltage errors, the measured DC bus voltage is used to distinguish between them:<br>- DC bus voltage is below a specified threshold<br>→ this fault was declared.<br>- DC bus voltage is above a specified threshold<br>→ 116 Inv HW Ovt would have been declared.<br><br>For all other drives except the 25A drive:<br>The inverter current exceeded a preset level, detected via hardware, (ERR1/INV_FLT: P1-12 ) to the GDCB.<br><br>Note: This fault indicates a too high motor current or an IGBT short circuit current. Then all PWM control is immediately stopped.<br><br><u>Possible Causes & Solutions</u><br>• Incorrect motor phasing → change parameter Motor Phase 0/1.<br>• Shorted motor phase → check motor wiring continuity.<br>• Defective hardware (e.g. shorted IGBT) → change drive package (if occurs permanently) |
| 109 Overload | E4 | An overload condition has been detected. The drive exceeded the maximum time allowed operating at the rated current of the motor.<br><br><u>Possible Causes & Solutions</u><br>• Excessive friction in system → check for dragging brake or hoistway interference.<br>• The drive is undersized for the installed duty → confirm system inertia.<br>• The fault threshold can be adjusted by the parameters: Overload sec, Rated mtr i Arms, and Rated 81inim PU, but should not be increased by more than 10%. |
| 110 Drive Limit | W | The drive is operating at its rated current limit. |
| 111 No Id fdbk<br>112 No Iq fdbk | E4 | An error has been detected with the current feedback of the inverter during magnetization of the motor at the beginning of the run.<br><br><u>Possible Causes & Solutions</u><br>• Open motor phase → check motor wiring continuity.<br>• Bad current sensor → return unit for service.<br>See parameters Vd out thresh PU and Vq out thresh PU. |
| 113 Inv IPM Flt | E4 | **Applicable only when Drive Type is 25A or LCRD.**<br>Indicates a fault has been detected from the inverter Intelligent Power Module (IPM).<br><br><u>Possible Causes & Solutions</u><br>• Defective or shorted gate power supply → change drive package (if occurs permanently).<br>• Incorrect motor phasing → change parameter Motor Phase 0/1.<br>• Shorted motor phase → check motor wiring continuity. |
| 114 Curr Ovrload | E4 | Not used (was applicable only for non-regen drives). |
| 115 Brk Chop Err | E4 | Not used (was applicable only for non-regen drives). |

| | | |
|---|---|---|
| 116 Inv HW Ovt | E4 | **Applicable only for 60A V.2 drives.**<br>The power section has detected a fault and set the discrete input (ERR1/INV_FLT: P1-12 ) to the GDCB. Because this input is shared by both HW Overcurrent and HW Overvoltage errors, the measured DC bus voltage is used to distinguish between them:<br>- DC bus voltage is above a specified threshold<br>→ this fault was declared.<br>- DC bus voltage is below a specified threshold<br>→ 108 Inv HW Oct would have been declared. |
| 117 Inv Pfai Flt | E4 | **Applicable only for 60A/120A/160A V.2 and 20A/30A/40A V.2.1 and 30A/40A V.2.2 drives.**<br>Inverter PWM activity has been detected during IDLE (when S1 & S2 are dropped):<br>• after 2 seconds in IDLE the inverter PWM driver was still active;<br>• or after 4 seconds in IDLE the signal PF_IGBT: P1-13 was LOW which indicated a still active IGBT power supply although it should be switched OFF.<br>Possible Causes & Solutions<br>• Defective gate driver or power supply → change drive package (if occurs permanently). |
| 118 Overload Dec | D4 | **Applicable only for "JIS Function 0/1" = 1**<br>See 109 Overload**.** |
| 119 Desat Err | E4 | The inverter current and the converter current exceeded a preset level, detected via hardware. |
| 120 Output Cur | - | Reserved for Ultra drive. |
| 121 SR1 Err | E4 | **Applicable only for "JIS Function 0/1" = 1 and "Drive Type" = 428 or 460.**<br>SR1 was off with Inverter running.<br>The wiring of Inverter output is disconnected with SR1-OFF.<br>Possible Causes & Solutions<br>• Check wiring around SR1 relay and P5-5 of GDCB<br>Check a SR1 control of UCMP module |
| 122 Inv DeSat | E4 | Not supported |
| 123 CnvOverload | E4 | **Applicable to ACD5 only.**<br>This fault indicates the current ratings of the converter have been exceeded. See related parameters:" CnvOverload sec", "Rated CnvICon PU", "Rated CnvIAcc PU". |

## 6.4.12 Converter Current Faults

| SVT Display | | Description |
|---|---|---|
| 200 Cnv SW Oct | E4 | The magnitude of the converter current exceeded an allowed threshold.<br><br>Possible Causes & Solutions<br>• Defective hardware → change drive package (if occurs permanently).<br>• The fault threshold can be temporarily adjusted by the parameter Cnv I Limit %.<br>**Applicable when Interface Type = 0 or 1:**<br>OCT(A) = Drive I fullscale * Cnv I Limit %* 0.9 * 1.05<br>(Drive I fullscale: 402→ 80A 404→110A)<br>**Applicable when Interface Type = 2 or 3:**<br>OCT(A) = Drive I fullscale * Cnv I Limit %* 0.9 * 1.25 |
| 201 Cnv Id Error<br>202 Cnv Iq Error | E4 | The indicated converter current error exceeded 30% of full-scale.<br><br>Possible Causes & Solutions<br>• Current regulators are not tuned correctly → check proper parameter settings (see parameter Cnv Custom 0/1). |
| 203 Cnv Ix Offst<br>204 Cnv Iy Offst | E | The indicated converter phase current offset exceeded 5% of full-scale.<br><br>Possible Causes & Solutions<br>• Defective circuit → change drive package (if occurs permanently). |
| 205 Cnv Gate Flt | E4 | **NOT applicable when Drive Type is 25A.**<br>A converter IGBT gate supply voltage fault was detected (converter PF_IGBT signal on most drives).<br><br>Possible Causes & Solutions<br>• Defective or shorted gate power supply → change drive package (if occurs permanently). |
| 206 Cnv HW Oct | E4 | **NOT applicable when Drive Type is 25A.**<br>The converter current exceeded a preset level, detected via hardware.<br><br>Note: This fault indicates a too high line input current or an IGBT short circuit current.<br><br>Possible Causes & Solutions<br>• Defective hardware → change drive package (if occurs permanently). |
| 207 Cnv Gnd Flt | S | **Applicable only when Drive Type is 60A.**<br>A ground fault was detected on the converter.<br><br>Possible Causes & Solutions<br>• Ground fault → disconnect drive from utility power and check that there are no phases shorted to ground. |
| 208 Bus Cap Fail | S | The estimated power loss in the drive exceeded a limit. This indicates that excessive power is being dissipated in the drive and is a strong indication that a DC link capacitor has failed. The threshold for this fault is set by the SVT parameters Ploss Thr pre %, Ploss Thr idle %, and Ploss Thr run %. See also ARO Vbus fil ms. |

| | | |
|---|---|---|
| 209 DC Link OCT | S | **Applicable only when Drive Type is 40A.**<br>Indicates excessive DC link current.<br><br>Possible Causes & Solutions<br>• Shorted motor phase → check motor wiring continuity.<br>• Ground fault → disconnect drive from utility power and check that there are no phases shorted to ground. |
| 210 Cnv IPM Flt | E4 | **Applicable only when Drive Type is 25A or LCRD.**<br>Indicates a fault has been detected from the converter Intelligent Power Module (IPM).<br><br>Possible Causes & Solutions<br>• Defective or shorted gate power supply → change drive package (if occurs permanently).<br>• Defective IPM hardware → change drive package (if occurs permanently).<br>• Ground fault → disconnect drive from utility power and check that there are no phases shorted to ground. |
| 211 Battry Chrgd | E4 | **Applicable only during ARO (EN) mode.**<br>The drive detected charging current into the battery during ARO, which is not allowed. The threshold for the charging currenmt is controlled by the parameter Max Bat Chrg I A. |
| 212 Cnv Vmag Flt | E | Generally, this fault occurs when power is removed from the drive AC input during a regenerative run. This fault may also occur in concert with certain loss of safety chain events, but this should not be a concern (loss of safety chain causes an estop anyways). This fault management is designed to protect other in-ciruit controller components when the AC line is lost during a regenerative run.<br><br>If this fault occurs in such a way that interrupts normal elevator operation, then this condition should be reported, and the fault management can be disabled by increasing the Cnv Vmag Thrs PU parameter.<br><br>This fault management is active only when the drive is regenerating and only when the nominal AC line voltage parameter AC Main Vrms is set <= 400. This fault management is not active when Low Volt Op 0/1 is set to 1. |
| 213 Cnv I Imbal | E4 | Not supported |
| 214 Cnv DeSat | E4 | Not supported |

## 6.4.13 Voltage Faults

| SVT Display | | Description |
|---|---|---|
| 300 DC Bus Over | E3 | The DC bus voltage was greater than 108% of the nominal bus voltage of 750 VDC.<br>Possible Causes & Solutions<br>Check parameter DBR Mode 0-3 is set correctly.<br>Check parameter Inertia kg-m2 is not set too high.<br>One way to estimate the inertia is to use the following formula:<br>J = 2 + 6 * DUTY_LOAD * (SHV_RADIUS^2)<br>Other ways to estimate inertia are given in Sections 9.1 and 9.2. |
| 301 DC Bus Under | E6 | The DC bus voltage exceeded a limit. The limits are:<br>For 415 < Vac <= 480, limit = 70% of nominal (750).<br>For 380 <= Vac <= 415, limit = 309 Vdc.<br>For Vac < 380, limit = 70% of nominal (750).<br>The nominal ac voltage is determined by the EEPROM parameter: AC Main Vrms. |
| 302 VAC Over | C | The AC line voltage exceeded a limit. The limits are:<br>For 415 < Vac <= 480, limit = 112% of nominal (110% cleared).<br>For 380 <= Vac <= 415, limit = 477 Vrms (469V cleared).<br>For Vac < 380, limit = 115% of nominal (113% cleared).<br>The nominal voltage is determined by the EEPROM parameter: AC Main Vrms. |
| 303 VAC Under | C | This fault indicates the AC line voltage was below a limit. The limit value depends on whether the drive's "brown-out" functionality is enabled or not:<br>• **For CAN interface (interface type 1) and not JIS and HSOVF**, where profile generation is **internal** to the drive, the brown-out function is **enabled**.<br>  • If the AC line voltage falls 15% below nominal, the brown-out function is activated, the speed is reduced, and the "310 AC Brown-out" warning is logged.<br>  • If the AC line voltage falls to 30% below nominal, then additional speed reduction occurs and the "303 VAC Under" fault is logged.<br>• **For other interfaces**, where profile generation is **external** to the drive, the brown-out function is **disabled**.<br>  • If the line voltage falls to 15% below nominal, then the "303 VAC Under" fault is logged.<br>• In both cases, the fault response to "303 VAC Under" is:<br>  • complete the current run,<br>  • go to drive state shutdown,<br>  • exit shutdown as soon as the fault clears. The fault is self clearing.<br>• "**Nominal**" voltage is defined as follows:<br>  • 380 Vrms for 380 <= Vac <= 415;<br>  Vac otherwise,<br>where Vac = EEPROM parameter: AC Main Vrms |

| | | |
|---|---|---|
| | E | **Only for JIS and HSOVF with Interface type CAN**,<br>The AC line voltage exceeded a limit. The limits are:<br>For 415 < Vac <= 480, limit = 80% of nominal. (85% cleared)<br>For 380 <= Vac <= 415, limit = 304 Vrms. (323V cleared)<br>For Vac < 380, limit = 80% of nominal. (85% cleared)<br>The nominal voltage is determined by the EEPROM parameter: `AC Main Vrms`. |
| `304 VAC Imbal` | C | The AC line input voltages differ from each other by more than 10%. |
| `305 PLL Unlock` | E | The phase lock loop on the AC input voltage has unlocked. This is likely to occur when you try to run with a damaged IGBT.<br>This fault sets the SAS flag. |
| `306 Single Phase` | S | This fault is declared when the drive is set to single-phase mode, and the T phase is connected to a live input. The power during single-phase operation should be connected to R and S phases only and the T-phase should be left open. See EEPROM parameter: `Single Phase 0-3` |
| `307 PLL Freq Rng` | E | This fault is declared when the drive ac line frequency estimate is outside of a frequency band specified by the parameter PLL freq band Hz for a amount of time specified by the parameter PLL freq time ms, while there is no PLL unlock fault. This fault is logged whenever the AC line is disconnected. Repeated logging may be an indication of a problem with the AC line. |
| `308 Welded Mx/Px` | S | When the drive enters the power down state, if the DC Bus voltage does not drop below a voltage threshold within a (drive-type depending) wait time, the system will declare that the MX and/or PX contacts may be welded.<br><br>**Warning:**<br>***Do not cycle power to drive until fault is verified***.<br>Check the "Inp:Vrms Vdc" SVT display to verify whether the Vdc is actually stuck to a high value (1.41 times the Vrms value) while the state of MX and PX in the "MX PX DX BX" SVT display is actually "0". If these conditions are met (high Vdc and "0" for both MX and PX), then DO NOT ATTEMPT TO CYLE POWER TO THE DRIVE. This drive may have a real welded MX or PX condition that needs to addressed. For this condition, power down, lock out/tag out energy source, and ship drive back to factory. |
| `309 Vscales off` | W | This fault is logged when the measured AC line voltage and measured DC bus voltage disagree significantly. This check is performed only after M1 is picked after the bus has had enough time to settle to its quiescent value. This fault may indicate that either of the following EEPROM parameters is not set correctly: DC Bus fscale V, AC Line fscale V. |
| `310 AC Brown-out` | W | **Applicable only for Interface Type 1.**<br>This warning indicates that the ac line has dropped 15% below the nominal value. When the ac line drops 30% below nominal, 303 VAC Under fault is logged. The drive will continue to run under the "Brown Out" event with reduced motion profiles. However, in case of "303 VAC Under", the drive will finish the current run and not accept any further runs.<br>*Maskable via parameters "`MaskOut Warning1`" and 2.* |

| | | |
|---|---|---|
| 311 AC All Err | E | **This fault can occur for one of two reasons:**<br><br>1. The AC line voltage exceeded a limit above the 302 VAC Over threshold. The limits are:<br>For 415 < Vac <= 480, limit = 125% of nominal.<br>For 380 <= Vac <= 415, limit = 519 Vrms.<br>For Vac < 380, limit = 125% of nominal.<br>The nominal voltage is determined by the EEPROM parameter: AC Main Vrms.<br>OR<br>2. The following three faults occur at the same time while PTR is active:<br>302 VAC Over AND<br>304 VAC Imbal AND<br>307 PLL Freq Rng |
| 312 DBTR ShrtErr | C | **Applicable only for ARO Type=NIARO (JIS) and DBR ENE=1 DIS=0.**<br>This fault is set for detecting the short of DBTR.<br>When using a generator, set DBR ENE=1 DIS=0 for 1.<br>When using NIARO mode, set ARO Type for 3.<br>Check DBTR if it has broken. |
| 313 AC/DC Calib | I | **Applicable only when Low Volt Op 0/1 = 1.**<br>This fault is active only in low voltage operation mode. This indicates that the calibration process ac voltage sensor versus dc voltage sensor resulted with a cross calibration factor that is either larger than 1.5 or less than 0.5. |
| 314 Cnv Res FltV | E | This fault management is active only when the event 304 VAC Imbal is active. This fault occurs when a converter voltage transient occurs that exceeds a threshold that is at least 25% greater than the AC Main Vrms parameter setting. If this fault occurs, then check that the 3 phase AC input is present and is reasonably balanced. |
| 315 Cnv Res FltF | E | This fault occurs when a voltage resonance occurs at the AC input of the drive due to an intermittent loss of an input phase. If this fault occurs, then check that the 3 phase AC input is present, connected well, and is reasonably balanced.<br>**This fault is active only for the 60A/120A/160A V.2 drives.** |
| 316 BatOverVolt1 | | Reserved for Low Voltage Drive.<br>*Maskable via parameters "MaskOut Warning1" and 2.* |
| 317 BatUnderVolt | | Reserved for Low Voltage Drive.<br>*Maskable via parameters "MaskOut Warning1" and 2.* |
| 318 OCBT Under | | Reserved for Low Voltage Drive. |
| 319 Cnv i imbal | E | **Applicable only for drive type 160A-CR.**<br>This fault detects current imbalance in the converter and shuts down the drive to prevent hardware damage. Current imbalance happens when a phase is lost. |
| 320 CNV NBus Flt | | **Reserved** |
| 321 INV NBus Flt | | **Reserved** |
| 322 NBus OverFlt | E1 | **Reserved** |
| 323 SSO OverVolt | E4 | **Reserved** |
| 324 SSOAcLineFlt | E4 | **Reserved** |
| 325 NoAc-HighPwr | E4 | **Applicable only to ACD5 drive only**<br>This faultmanagement detects AC line interruption using converter regulator error under during high current condition |
| 326 Hybrid-DcFlt | E4 | **Applicable to ACD5 drives only**<br>The event is logged when the bus voltage error is above the threshold set by "VbusRipple Lvl V ", for a length of time specified by "VbusRippleTime S" and the frequency is between 30HZ to 360HZ. |

### 6.4.14 Brake Faults

| SVT Display | | Description |
|---|---|---|
| 400 Brake S1 SAS<br>401 Brake S2 SAS | C4 | The indicated brake switch is in the wrong state. This is checked both when the drive is in the Idle state *and* when the drive is running.<br>These faults result in complete the run fault response and set the SAS flag.<br><br>**Note:** this event is also applicable when Brk Sw Type 0-6 is set to 0 or 4 where constant states are required on BS1 and BS2 inputs.<br><br>Possible Causes & Solutions<br>• Incorrect parameter value → verify correct value of Brk Sw Type 0-6.<br>• Incorrect brake switch wiring → check brake switch wiring.<br>• Brake not lifting → check brake wiring & brake power supply.<br>• Insufficient time allowed → see parameters Brk Pick Time ms and Brk Setl Time ms. |
| 402 Brake Status | E4 | **Applicable only when Int Brk Type 0-4 is set to 0.**<br>The brake status feedback from the brake module is not in the correct state. |
| 403 Brake BY | E4 | **Applicable only when Int Brk Type 0-4 is set to 0.**<br>One or both of the normally-closed BY contacts are not in the correct state. The BY relays should be energized when PTR is active, *before* the lift brake command is initiated.<br><br>Possible Causes & Solutions<br>• Incorrect wiring to brake module → check brake module wiring.<br>• Incorrect brake power supply → check brake power supply & wiring.<br>• Adjust SVT parameter: SX Pick Time ms |
| 404 Brake I Off | E4 | **Applicable only when Int Brk Type 0-4 is set to 1.**<br>When using the internal brake control, this fault is logged when the brake current feedback offset compensation exceeds the asmount specified by the parameter Brk I Offset A. |
| 405 Brake I Drop | E4 | **Applicable only when Int Brk Type 0-4 is set to 1.**<br>When the internal brake control drops the brake, this fault is logged if the brake current feedback exceeds a threshold specified by the service tool parameter Brk I Hold A. |
| 406 Brake I Hold | E4 | **Applicable only when Int Brk Type 0-4 is set to 1.**<br>When the internal brake control picks the brake, this fault is logged if the brake current feedback is less than a threshold specified by the service tool parameter Brk I Hold A. |
| 407 Brake I Max | E4 | **Applicable only when Int Brk Type 0-4 is set to 1.**<br>This fault is logged if the internal brake control current feedback exceeds a threshold specified by the service tool parameter Brk I Max A. |

| | | |
|---|---|---|
| 408 Brk S1 ESTOP<br>409 Brk S2 ESTOP | E4 | **Applicable only for HSOVF or 160ACR or Brake Torque Mode**<br>The indicated brake switch is in the wrong state. This is checked both when the drive is in the Idle state *and* when the drive is running.<br>These faults result in an immediate ESTOP and set the SAS flag.<br><br>**Note:** this event is also applicable when Brk Sw Type 0-6 is set to 0 or 4 where constant states are required on BS1 and BS2 inputs.<br>Possible Causes & Solutions<br>• Incorrect parameter value → verify correct value of Brk Sw Type 0-6.<br>• Incorrect brake switch wiring → check brake switch wiring.<br>• Brake not lifting → check brake wiring & brake power supply.<br>Insufficient time allowed → see parameters Brk Pick Time ms and Brk Setl Time ms. |
| 410 Low Speed | W | **Visible only when "**TwoStepSpeed 0/1**" = 1.**<br>This fault indicates illegal configuration of the position sensor for the two step speed profile operation. Can NOT operate the two step speed profile operation. Only Low speed operation.<br><br>**NOTE**: Initially, the car has to run from BOTTOM to TOP to detect the installation position of the position sensor for two step speed profile operation. Before this initial operation is finished, the "410 Low Speed" cannot clear and will only operate the low speed. |
| 411 Brk S1 DECEL | D4 | **Applicable only for "JIS Function 0/1" = 1**<br>See: 400 Brake S1 SAS, 401 Brake S2 SAS, 408 Brk S1 ESTOP 409, Brk S2 ESTOP |
| 412 Brk S2 DECEL | D4 | **Applicable only for "JIS Function 0/1" = 1**<br>See: 400 Brake S1 SAS, 401 Brake S2 SAS, 408 Brk S1 ESTOP 409, Brk S2 ESTOP |
| 413 Bk Desat Err | E4 | **Applicable only for "Drive Type" = 234, 428 or 460**<br>The brake current exceeded a preset level, detected via hardware. |
| 414 Bk Bus Over | I | **Applicable only for "Drive Type" = 234, 428 or 460**<br>The brake bus exceeded threshold data. |
| 415 Bk Bus Under | I | **Applicable only for "Drive Type" = 234, 428 or 460**<br>The brake bus fell below threshold data. |
| 416 Bk fbk tmout | E4 | **Applicable only for "Drive Type" = 234, 428 or 460**<br>The brake pick current did not exceed threshold data of Brake Pick state. |
| 417 Bk SW Oct | E4 | **Applicable only for "Drive Type" = 234, 428 or 460**<br>The magnitude of the brake current exceeded an allowed threshold. |
| 418 Bk lft tmout | - | **Applicable only to Ultra drive.** |
| 419 Bk drp tmout | - | **Applicable only to Ultra drive.** |
| 420 Bk Dly DetW | W | **Applicable only for "JIS Function 0/1" = 1**<br>This is for Brake Delay Detection. This is detected If it passed specific time from LB to "Brake picked".<br>Or it detects when BS is OFF during running. |
| 421 Bk Dly DecE | S | **Applicable only for "JIS Function 0/1" = 1**<br>This is for Brake Delay Detection. This is detected If it passed specific time from LB to "Brake picked".<br>Or it detects when BS is OFF during running, then the running is completed.<br>But can not do further run until POR or Block Clear. |
| 422 Brk ShrtCrkt | | Reserved for Low Voltage Drive. |

| | | |
|---|---|---|
| 423 Brk I State | E4 | **Applicable only if "Int Brk Type 0-4" is set to 1 or 2.**<br>Brake current was detected just before the lift brake command. Double check brake wiring to make sure that brake is not energized at the prepare to run command and before the lift brake command. |
| 424 Brake I Neg | E4 | **Applicable only if "Int Brk Type 0-4" is set to 2.**<br>Negative brake current has been detected. Double check any brake current hardware connections and brake power supply connections to see if they are correct. If all connections are correct, then the brake current sense hardware may be damaged. |
| 425 Hyd Pump Flt | C | **This is for Hydraulic pump unit of 78T machine.**<br>The HPU has some failure. |
| 426 BTI NG LOCK | ERS | **Applicable only for Interface Type 1 and only if "Self BTI Block " is set to 0 and "Lockup by S-BTI " is set 1.**<br>This event is detected by the NG failure of Self-BTI with "BRK TRQ %Load2" condition or "030 MotorRun Err". And then it sets the "BTI Block" with drive shutdown, and then any attempt run is prohibited. After the ERO/TCI switch is turned ON/OFF 3 times, the inspection run is enabled for rescue operation.<br>The "BTI Block" is canceled only for good result of Manual BTI test or special command required. |
| 427 Chk Man BTI | W | This event is detected by the NG failure of Self-BTI with "BRK TRQ %Load1" condition.<br>The brake torque should be verified by Manual BTI again. |
| 428 Brk S3 DECEL<br>429 Brk S4 DECEL<br>430 Brk S5 DECEL | D4 | **Applicable only for GDCB2 Drives**<br>As 411 Brk S1 DECEL but for brake switches 3,4,5 .<br>Note: With Brk Sw Type 0-6 not set to 7, this fault may occur if the unused BS input is not wired to GND. |
| 431 Brk S3 ESTOP<br>432 Brk S4 ESTOP<br>433 Brk S5 ESTOP | E4 | **Applicable only for GDCB2 Drives**<br>As 408 Brk S1 ESTOP but for brake switches 3,4,5 .<br>Note: With Brk Sw Type 0-6 not set to 7, this fault may occur if the unused BS input is not wired to GND. |
| 434 Brake S3 SAS<br>435 Brake S4 SAS<br>436 Brake S5 SAS | C4 | **Applicable only for GDCB2 Drives**<br>As 400 Brake S1 SAS but for brake switches 3,4,5 .<br>Note: With Brk Sw Type 0-6 not set to 7, this fault may occur if the unused BS input is not wired to GND. |
| 437 Bk UCM Relay | E1 | **Applicable only to 430ML drive** |
| 438 Brk Cur Undr | I | **RESERVED** |

## 6.4.15 Motion Faults

| SVT Display | | Description |
|---|---|---|
| 500 Overspeed | E4 | The motor speed has exceeded a speed threshold. The speed threshold is determined by the operating mode of the drive:<br>MCSS mode: adjustable perecentage of Duty Speed mm/s<br>Manual Mode: adjustable percentage of Man Speed mm/s<br>CAN Normal: 110% of Duty Speed mm/s<br>CAN Relevel: fixed percentage of max relevel = 20 mm/sec<br>CAN Learn: fixed percentage of max learn = 500 mm/sec<br>CAN ERO/TCI: fixed percentage of Insp Speed mm/s<br>CAN Rescue: fixed percentage of max rescue = 300 mm/sec<br>For MCSS and manual modes, the percentage is adjusted by SVT parameters: MCSS Overspeed % and MAN Overspeed %. |

| | | |
|---|---|---|
| 501 Pos Tracking | E4 | The position tracking error exceeded a threshold and indicates that the position feedback was not tracking the position reference from the profile generator. This fault is checked only when the drive uses its internal profile generator. See EEPROM parameter: Pos Err Lim mm |
| 502 Vel Tracking | E4 | The velocity tracking error exceeded a threshold. The velocity feedback was not tracking the velocity reference.<br><br>Possible Causes & Solutions<br>• Incorrect motor phasing → change parameter Motor Phase 0/1.<br>• Wrong encoder feedback → check encoder wiring and attachment.<br>• Incorrect parameter value → verify correct value of Inertia kg-m2.<br>• Excessive start jerk / improper pre-torque → verify load weigh device; if no load weigh device present (as during inspection), try increasing parameter Start Gain Ot PU. See section 4.11 for further instruction.<br>• Brake not lifting → check brake wiring & brake power supply.<br>• Hoistway obstructed → check for obstruction (e.g. car or counterweight on buffer).<br>• The fault threshold can be adjusted by parameter Track Error mm/s. When Manual Mode is active, this fault threshold is automatically increased by a factor of 3. |
| 503 LRT Motion | E4 | This fault indicates motion was detected while performing the Locked Rotor Test. The Locked Rotor Test is performed at the beginning of the first run after a power-up to determine the position of the magnets when using a PM motor. The threshold for the fault is specified by the parameter LRT mot err eDeg. If the fault occurs, the brake may not be set properly.<br>When this fault continued 6 times without a success LRT, the drive state moves to shutdown state. This shutdown is cleared by "CLEAR BLOCK 2-4". |
| 504 Enc Pos Err | W | This fault indicates that the drive has lost track of the magnet position when using a PM motor. This fault is necessary to prevent a loss of torque production. This fault may be caused by the encoder physically slipping with respect to the motor, or by a bad magnet position calculation during the locked rotor test (LRT).<br><br>This fault is detected by comparing the magnet position, derived from the encoder and the result of the LRT, to the estimated magnet position based on the back-EMF of the motor. Since the estimator is back-EMF based, the fault detection is enabled only when the motor operates above 30% of the rated motor speed. The default threshold for the fault is 20 electrical degrees. Another locked rotor test will be performed at the beginning of the next run to automatically re-determine the magnet position.<br><br>See EEPROM parameter: Mag err thr eDeg<br>See EEPROM parameter: Rated Motor rpm<br>See display parameter: MagErr1 MagErr2 |
| 505 SPARE | D | Not used. |
| 506 Stopping Err | W | A time-out occurred because the stopping criteria at the end of the run were not satisfied. See EEPROM parameters: Pos Stop Tol mm and Vel Stop mm/sec.<br>*Maskable via parameters "MaskOut Warning1" and 2.* |

| | | |
|---|---|---|
| 507 Pos at 1LS | NC | **Applicable only for Interface Type 1.**<br>Unexpected position at 1LS. The 1LS transition occurred at a position outside the expected range for 1LS, or the 1LS signal state is not consistent with hoistway position. Applicable only when landing table is valid and position is valid. |
| 508 Pos at 2LS | NC | **Applicable only for Interface Type 1.**<br>Unexpected position at 2LS. The 2LS transition occurred at a position outside the expected range for 2LS, or the 2LS signal state is not consistent with hoistway position. Applicable only when landing table is valid and position is valid. |
| 509 Floor at 1LS | NC | **Applicable only for Interface Type 1.**<br>Unexpected floor at 1LS. The 1LS transition occurred at a floor that is different from the expected floor. Applicable only when landing table is valid and limit switch signals are valid. |
| 510 Floor at 2LS | NC | **Applicable only for Interface Type 1.**<br>Unexpected floor at 2LS. The 2LS transition occurred at a floor that is different from the expected floor. Applicable only when landing table is valid and limit switch signals are valid. |
| 511 1LS & 2LS ! | NC | **Applicable only for Interface Type 1.**<br>Both LS signals are valid and active simultaneously.<br><br>This fault is used to decide if the NEXT COMMITTABLE fault response shall continue. If this fault is not detected with a certain time, or the fault "906 No LS Msg" is not detected within a certain time, then the fault response is changed from NEXT COMMITTABLE to TIMED DECEL.<br><br>If this fault persists at the end of a run, the drive will transition to (state, substate) = (IDLE AVAILABLE, RescueOnly). When the drive is in this substate, only commands for Rescue, ERO, ARO and MRO runs are accepted and LS are subsequently ignored. |
| 512 Missing Vane | NC3 | **Applicable only for Interface Type 1.**<br>Expected vane is missing. Logged only when outside a vane and an expected transition onto a vane has not occurred. Not checked in Inspection or Correction runs. |
| 513 No PRS Trans | NC3 | **Applicable only for Interface Type 1.**<br>Expected transition is missing. Logged only when on a vane and an expected transition has not occurred. Not checked in Inspection or Correction runs. |
| 514 Enc <> Vane | NC3 | **Applicable only for Interface Type 1.**<br>An unexpected vane transition occurred. Possible causes could be:<br><br>1. Incorrect Car Dir 0/1 setting.<br>2. Wrong Vane Sensor Type parameter setting.<br>3. PRS sensor signal wiring mistake.<br>4. PRS is having false transitions.<br>5. Encoder is not firmly attached to rotor.<br>6. Magnet has moved since it was learned during the learn run.<br>7. Belts are slipping or creeping over the drive sheave excessively.<br>8. Belts are stretching excessvely. |

| | | |
|---|---|---|
| 515 NTSD failed | W | **Applicable only for Interface Type 1.**<br>During a normal run, the normal stopping profile did not decelerate the car in time to meet the target. The timed-decel is two-phased, containing a creep region. Only triggered at the terminal landings. The condition for triggering the fault is that the normal profile overshoots the target compared to a linear ramp-down of the speed at 110% of normal decel rate. Only triggered above a certain speed (presently 0.1 m/s). |
| 516 Corr failed | D | **Applicable only for Interface Type 1.**<br>A correction run missed the target. This fault is triggered when a correction run terminates outside of the limit switches or outside a vane, or at a different landing other than the terminal landing. The fault is logged after the car has stopped.<br>*Note: There is a minor bug with the SVT display for this fault. The fault response in the SVT is shown as ESTOP, when it is actually DECEL.* |
| 517 DDP Error | E1 | **Applicable only for Interface Type 1.**<br>Delayed Drive Protection (DDP) fault. The time between vanes has exceeded a specified value. It is not checked during ERO or TCI runs. The fault is cleared by any of the following:<br>• ERO run<br>• TCI run<br>• SVT M2-4 "CLEAR BLOCK"<br>The fault is not cleared by POR.<br>The drive will stay in IDLE and accept only TCI and ERO commands.<br>The time between vanes is specified by the EEPROM parameter: DDP sec. |
| 518 BeltCmp Wrng | W | **Applicable only for Interface Type 1.**<br>This indicates that the compensation factors for belt and traveling cable imbalance determined during the learn run were exceptionally large (specifically, the offset factor was greater than 25% rated torque). The compensation factors can be viewed in the SVT display: BeltCmp:Slp mA/m, BeltCmp:Offset A. |
| 519 RlvPermitErr | W | **Applicable only when Interface Type is 1 and Load Weigh Type is 1.**<br>Controller has given permissive to relevel while load weighing system indicates overload condition. This contradictory situation has persisted for >200ms. |
| 520 Rllbck Start | W | **Applicable only for Interface Type 1.**<br>Rollback of more than 5.0 mm at beginning of run.<br>*Maskable via parameters "MaskOut Warning1" and 2.* |
| 521 Rllbck Stop | W | **Applicable only for Interface Type 1.**<br>Rollback (reverse to direction of run) or overshoot (in direction of run) of more than 5.0 mm at ending of run.<br>*Maskable via parameters "MaskOut Warning1" and 2.* |
| 522 ManualRescue | D | **Applicable only for Interface Type 1.**<br>SPBC message reports that the car has been moved for manual rescue (drive powered off, SPBC lifts brake). The drive's stored position is invalidated and a locked rotor test initiated before the next run. |
| 523 Moved at POF | W | **Applicable only for Interface Type 1.**<br>The SPBC or GECB and the drive have contradictory position information (at power up): the SPBC's or GECB's position has been assumed by the drive**.** |

| | | |
|---|---|---|
| 524 No Enc Signl | E | **Applicable only when `Encoder Type 0/1` is set to 0 (incremental, double-ended).**<br>Encoder channel A input is not detected. Encoder may not be connected, encoder power supply may have failed, or encoder may have failed. This fault sets the SAS flag. |
| 525 NoRlv SpdChk | D[1] | Relevel speed is too high (>= 0.285 m/s). |
| 526 NoRlv TooMny | D[1] | This event indicates the drive attempted 20 consecutive relevel runs without the start of a normal run. If hovering is enabled, then the threshold is 40 consecutive relevel runs.<br><br>After 20 (or 40 if hovering) relevel attempts, further relevel runs are prohibited until after the start of a normal run (or TCI/ERO, Correction, Rescue, Learn Runs). |
| 527 NoRlv LostDZ | D[1] | Lost DZ signal or detecting UIS/DIS signal disagreeing with mm-position (on opposite side of target mm-position). |
| 528 Profile Err | W | The profile chosen is not compatible with the system environment:<br>A) The LS1 or LS2 lengths (learned during learn run) are too short for the drive to be able to stop within. This can be caused by too large speeds in the profile setting or too small deceleration entered. The other possibility would be a really short LS magnet. Cause A can be identified in the vane monitor M-1-7 by comparing measured LS to minimum required.<br>B) The Nom Speed is set too high for the LS signal latency reported by the ICD of the GECB/TCBC (e.g. Nom Speed > 1.8m/s with TCBC). This setting could lead to CORR runs not reaching the target vane. This condition also depends on Vane Sensor Type. |
| 529 No enc fdbck | E4 | This fault indicates that the motor started moving without an encoder. This fault is triggered when the motor voltage exceeds a certain threshold defined by No Enc VThrs PU while the encoder speed feedback is below 1mm/s. Check the integrity of the encoder. Also, check motor parameters. |
| 530 No enc tmout | E4 | This fault indicates that the drive started commanding velocity profile and the motor speed feedback did not exceed 1mm/s for the time duration defined by the parameter No enc flt t sec (default value of the parameter is 0.4 secs). This fault detection is not active in Manual Mode.<br><br>Possible Causes & Solutions<br>• No encoder feedback signal → check encoder wiring and mechanical attachment to the sheave.<br>• Incorrect parameter value → verify correct value of Inertia kg-m2, Man Acc mm/s2, Accel mm/s2, or any of the acceleration parameters in the (L)MCSS if operating in 422 mode.<br>• Excessive start jerk / improper pre-torque → verify load weigh device; if no load weigh device present (as during inspection), try increasing parameter Start Gain Ot PU. See section 4.11 for further instruction.<br>• Brake not lifting → check brake wiring & brake power supply.<br>• Hoistway obstructed → check for obstruction (e.g. car or counterweight on buffer).<br>• The fault threshold can be adjusted by parameter No enc flt t sec |
| 531 PRS Sigs 1LS | NC | **Applicable only for Interface Type 1.**<br>The transition into 1LS occurred with PRS signals that are not expected near the learned LS transition point. Applicable only when landing table is valid and limit switch signals are valid. |

| | | |
|---|---|---|
| 532 PRS Sigs 2LS | NC | **Applicable only for Interface Type 1.**<br>The transition into 2LS occurred with PRS signals that are not expected near the learned LS transition point. Applicable only when landing table is valid and limit switch signals are valid. |
| 533 ARO Overspd | E | **Applicable only when Interface Type = 2 or 3.**<br>**Applicable only when "ARO Type" = 2 (Interruptable ARO).**<br>This fault is declared when the motor speed has exceeded a speed threshold set by the parameter ARO Overspeed % as a percentage of ARO Speed mm/s. This fault is disabled with ARO Overspeed % =0. If this fault is logged, the run is immediately terminated by the drive. |
| 534 ABL Abort:LW | ER | **Applicable only for Interface Type 1.**<br>A command for advanced brake lift was received and ignored because no valid load data was available. |
| 535 Timeout PTR | ERS | **Applicable only for Interface Type 1.**<br>While in state "Prepare To Run" (during Advanced Brake Lift), the drive did not receive a command to leave this state and timed out after 60s. |
| 536 Timeout LB | ERS | **Applicable only for Interface Type 1.**<br>While in state "Lift Brake" (during Advanced Brake Lift), the drive did not receive a command to leave this state and timed out after 16s. |
| 537 No EndRunCmd | ERS | **Applicable only for Interface Type 1.**<br>While waiting for a DriveCommand EndRun in substate "STOPPED" the drive did not receive this command and timed out after 3s.. |
| 538 Abort:EndRun | ER | **Applicable only for Interface Type 1.**<br>The run has been terminated with normally profiled deceleration by an OPB command (DriveCommand EndRun).. |
| 539 LvTransUnclr | NC3 | **Applicable only for Interface Type 1.**<br>With a single-sensor PRS, an ambiguous sensor transition has been detected, could have been either one of two vane edges. Potential root cause: Uncertain mm-position (ESTOP sliding, Power Up recovery from GECB/SPBC, position recovery in LS) and transition occurs within first 5mm of travel. |
| 540 Shock Detect | W | The shock condition was detected for REI/REM and EAR.<br>The following parameters define the thresholds for the fault detection:<br>Start Shock LVL%<br>Stop Shock LVL% |
| 541 SinCos Warng | W | This fault will be logged for one of the following conditions:<br><br>1. When using a CEIB and sin/cos encoder<br>A. If any of the analog encoder signals fail when using the CEIB, then this fault will be logged. Check the CEIB P2 connector to the GDCB P10 connector connection.<br>B. If the Encoder Type 0/1 SVT parameter has the wrong setting of "0", then this fault will be logged.<br>2. When using an incremental encoder without a CEIB<br>If the Encoder Type 0/1 SVT parameter has the wrong setting of "1", then this fault will be logged. |
| 542 Decel Req Fl | D | **Applicable to Interface Type = 3 only.**<br>A fault occurred and a timed decel is required, so a falsg is sent to the controller to request a timed-decel |
| 543 SSOoverSpeed | E4 | **Reserved** |

| | | |
|---|---|---|
| 544 Torq Obs Flt | E3 | This fault indicates that the torque observer error was above the fault threshold specified by the parameter: Torq Obs Err %.<br>The fault indicates that the atual troque feedback diverged from the expected torque and may indicate there is an obstruction in the hoistway or that belts/ropes friction is less than expected. |
| 545 Car Pos Err | E | **Applicable to "AHC Enable 0/1"= 1 only**<br>If the difference between the machine encoder and the top car encoder is greater than 200 mm for a single hovering/relevel run, then this fault occurs and ends the run immediately. If this fault occurs 4 consecutive times, then Advanced Hovering Control is disabled, and all subsequent hovering/relevel runs will use the machine encoder instead of the top of car encoder. If this fault occurs:<br>• Check that the top of car board has power<br>• Check that the top of car encoder is wired and connected correctly<br>• Check that the top of car board has the correct settings for the top of car encoder ppr, rated rpm, and contract duty speed<br>• Check the mechanical integrity of the top of car encoder and roller guide assembly<br>If a hovering/relevel run executes without this fault and other related AHC faults, then the AHC fault counter decrements. See "546 Car Vel Err", "549 AHC Enc/Vane", "AHC fault count", and "AHC Permissive" |
| 546 Car Vel Err | E | **Applicable to "AHC Enable 0/1"= 1 only**<br>If the velocity from the top car encoder is greater than 1000 mm/s for a single hovering/relevel run, then this fault occurs and ends the run immediately. If this fault occurs 4 consecutive times, then Advanced Hovering Control is disabled, and all subsequent hovering/relevel runs will use the machine encoder instead of the top of car encoder. If this fault occurs:<br>• Check that the top of car board has power<br>• Check that the top of car encoder is wired and connected correctly<br>• Check that the top of car board has the correct settings for the top of car encoder ppr, rated rpm, and contract duty speed<br>• Check the mechanical integrity of the top of car encoder and roller guide assembly<br>If a hovering/relevel run executes without this fault and other related AHC faults, then the AHC fault counter decrements. See "545 Car Pos Err", "549 AHC Enc/Vane", "AHC fault count", and "AHC Permissive" |

| | | |
|---|---|---|
| 547 CarEncErr NR | W | **Applicable to "AHC Enable 0/1"= 1 only**<br>For a Normal Run, if the difference between the machine encoder and the top of car encoder exceeds a threshold as defined by the "AHC Nm Enc Th mm" parameter setting, then this warning is logged, and the "AHC Permissive" is removed (set to 0). The "AHC Permissive" is not restored until another Normal Run is performed with an encoder difference that is below this warning threshold. If this warning occurs:<br>• Check the "TOC Car Dir 0/1" parameter setting<br>• Check that the top of car board has power<br>• Check that the top of car encoder is wired and connected correctly<br>• Check that the top of car board has the correct settings for the top of car encoder ppr, rated rpm, and contract duty speed<br>Check the mechanical integrity of the top of car encoder and roller guide assembly |
| 548 CarEncErr LR | W | For a Learn Run, if the difference between the machine encoder and the top of car encoder exceeds a threshold as defined by the "AHC Ln Enc Th mm" parameter setting, then this warning is logged, and the "AHC Permissive" is removed (set to 0). The "AHC Permissive" is not restored until another Learn Run is performed with an encoder difference that is below this warning threshold. If this warning occurs:<br>• Check the "TOC Car Dir 0/1" parameter setting<br>• Check that the top of car board has power<br>• Check that the top of car encoder is wired and connected correctly<br>• Check that the top of car board has the correct settings for the top of car encoder ppr, rated rpm, and contract duty speed<br>Check the mechanical integrity of the top of car encoder and roller guide assembly |
| 549 AHC Enc/Vane | D | **Applicable to "AHC Enable 0/1"= 1 only**<br>During a hover/relevel run, if the amount of car motion as detected by the top of car encoder is less than or equal to the value as defined by the "AHC Enc/Vn Th mm" parameter setting when the car moves away from the "center vane" position, then this fault is declared. If this fault occurs 4 consecutive times, then Advanced Hovering Control is disabled, and all subsequent hovering/relevel runs will use the machine encoder instead of the top of car encoder. If this fault occurs:<br>• Check that the top of car board has power<br>• Check that the top of car encoder is wired and connected correctly<br>• Check that the top of car board has the correct settings for the top of car encoder ppr, rated rpm, and contract duty speed<br>• Check the mechanical integrity of the top of car encoder and roller guide assembly<br>If a hovering/relevel run executes without this fault and other related AHC faults, then the AHC fault counter decrements. See "545 Car Pos Err", "546 Car Vel Err", "AHC fault count", and "AHC Permissive" |
| 550 Crp Time Low | | **Reserved** |
| 551 CrpSpe Boost | | **Reserved** |
| 552 CrpSpe inval | | **Reserved** |
| 553 DZ at Decel | | **Reserved** |
| 554 DZ lost Stop | W | **Reserved** |

| | | |
|---|---|---|
| 555 DZ too late | W | **Reserved** |
| 556 APRS step | E4 | **Applicable only for Interface Type 1 and Vane Sensor Type 88.**<br>An APRS position message has deviated >20mm from the encoder position. |
| 557 130% Mtr Frq | W4 | This fault indicates that the machine electrical frequency exceeds the 130% margin of the maximum motor frequency. A fault which results in drive shutdown if the two SVT parameters “Rated rpm” (menu 4-3-1) and “Number of Poles” result in a frequency greater than 30% of maximum Otis machine rated frequency. = 150 Hz *1.3 = 195 Hz |
| 558 150% Mtr Frq | E4 | This fault indicates that the machine electrical frequency exceeds the 150% margin of the maximum motor frequency. A fault which results in ESTOP if the dictated speed results in a frequency greater than 50% of maximum Otis machine rated frequency. = 150 Hz *1.5 = 225 Hz |
| 559 Enc Nois Flt | W | RESERVED |
| 560 APB Detected | W | Applicable only for Interface Type 0, 2, 3, and 4.<br>Abnormal passenger behavior was detected and APBD bit sent to MCSS to lower contract speed dynamically.<br>The following parameters define the thresholds for the fault detection:<br>APB Detect LVL %<br>APB Detect tim s |

*1) This Timed Deceleration reaction does not lead to the SHUTDOWN state*

## 6.4.16 Temperature Faults

| SVT Display | | Description |
|---|---|---|
| 600 Inv Tmp Warn | W | The temperature of the inverter heat sink has exceeded 80C. |
| 601 Inv Tmp Over | C[1] | The temperature of the inverter heat sink has exceeded 85C. The fault detection includes hysteresis, and will not clear until the temperature of the heat sink drops 5C below fault value. |
| 602 Inv Tmp Fail | C[1] | Indicates the analog temperature sensor on the inverter heat sink is not connected or has failed. The fan will turn on and remain on when this condition is detected. |
| 603 Cnv Tmp Warn | W | The temperature of the converter heat sink has exceeded 80C. |
| 604 Cnv Tmp Over | C[1] | The temperature of the converter heat sink has exceeded 85C. The fault detection includes hysteresis, and will not clear until the temperature of the heat sink drops 5C below fault value. |
| 605 Cnv Tmp Fail | C[1] | Indicates the analog temperature sensor on the converter heat sink is not connected or has failed. The fan will turn on and remain on when this condition is detected. |
| 606 Mtr Tmp Over | C[1] | The motor thermal contact has changed state indicating that either the motor is overheating or there is a problem with the contact circuitry. Check the motor temperature and the thermal contact. Although motor thermal contacts can be normally open or normally closed, the drive always expects a normally closed contact. If the thermal contact is normally open, a modification must be made to adapt it to the drive. |
| 607 Reactor Temp | C[1] | The thermal switch in the line reactor has opened, indicating an over-temperature condition in the line reactor. |
| 608 DBR Tmp Over | C[1] | Used only if parameters Interface Type = 1 and DBR Mode 0-3 > 0:<br>Overheat switch of external smart DBR unit has released. |
| 609 AC/DC Calibr | C | **Applicable only when “Low Volt Op 0/1” is set to 1.**<br>A calibration was performed to ensure that the AC voltage sense and the DC voltage sense are consistant. |

| | | |
|---|---|---|
| 610 Batt Ovr Tmp | I | The thermal sensor at the charger battery unit is reading high temperatures or disconnected. This could be due to:<br>• an error during the installation phase where the sensor is not connected<br>• the charger spent excessive time in the charge pending phase<br>• the battery ran into a hot condition.<br>Since the installation initially needs to be done correctly, this fault would mean that either battery/charger got into a hot condition due to the ambient or due to overcharging. If it persists for a long time it needs to be checked (job site visit). This timer = TBD minutes. |
| 611 MTC/RTC Flt | | Reserved for Ultra drive. |
| 612 Inv IGBT tmp | | Reserved for Ultra drive |
| 613 HSl Tmp Warn | W | **RESERVED** Applicable to NextUltra drive only.<br>The temperature of the lower heat sink has exceeded 80C. |
| 614 HSl Tmp Over | C1 | **RESERVED** Applicable to NextUltra drive only.<br>The temperature of the lower heat sink has exceeded 85C. The fault detection includes hysteresis, and will not clear until the temperature of the heat sink drops 5C below fault value. |
| 615 HSl Tmp Fail | C1 | **RESERVED** Applicable to NextUltra drive only.<br>Indicates the analog temperature sensor on the lower heat sink is not connected or has failed. The fan will turn on and remain on when this condition is detected. |
| 616 HSu Tmp Warn | W | **RESERVED** Applicable to NextUltra drive only.<br>The temperature of the upper heat sink has exceeded 80C. |
| 617 HSu Tmp Over | C1 | **RESERVED** Applicable to NextUltra drive only.<br>The temperature of the upper heat sink has exceeded 85C. The fault detection includes hysteresis, and will not clear until the temperature of the heat sink drops 5C below fault value. |
| 618 HSu Tmp Fail | C1 | **RESERVED** Applicable to NextUltra drive only.<br>Indicates the analog temperature sensor on the upper heat sink is not connected or has failed. The fan will turn on and remain on when this condition is detected. |

*1) When these temperature faults occur in 422 mode, PTR is not accepted until the fault condition clears. When these temperature faults occur in CAN mode, the drive behaves as follows:*

1. Normal runs are re-routed to the next committable landing.
2. Inspection runs (TCI+ERO) are terminated by timed deceleration.
3. All other runs (ARO, CORR, Rescue, MRO, Relevel) are completed to their regular end
4. No new run is allowed until the condition clears.
5. The fan is turned on 100%.

## 6.4.17 State Faults

| SVT Display | | Description |
|---|---|---|
| 700 Safety Chain | E/ W | The safety chain is not present. The opening of the safety chain will cause SX relays to drop, causing the drive to de-energized the motor and brake, thus causing an ESTOP.<br>• For 422 system, the response is ESTOP<br>• For CAN system, the response is LOG ONLY<br>*Note: Due to switch timing variation, this event can be logged sporadically when switching from NORMAL to ERO/TCI (no problem in unit)* |
| 701 No Man Input | E | This fault occurs if the drive is in manual mode and the manual mode jumper is removed. |

| | | |
|---|---|---|
| 702 Prechrg Time | W3 | This fault is declared when the DC bus fails to reach the charge voltage threshold within a time limit. The time limit is:<br>- 2.2 seconds for 60A V.2 drives,<br>- 4.4 seconds for 120A V.2 drives,<br>- 6.6 seconds for 160A V.2 drives,<br>- 1.2 seconds for 20A/30A/40A V.2.1, 30A/40A V.2.2 drives,<br>- 10 seconds for other regen drives.<br>The timer starts when the drive enters the precharge state.<br><br>For MCSS systems, the drive enters the powerdown state and waits 2 minutes, and then attempts again. For the regen drive, further precharge attempts are made only if the AC line voltage is within specification. There is no limit on the number of precharge attempts.<br><br>For CAN systems, the drive enters the powerdown state and waits 30 seconds, and then attempts again. For the regen drive, further precharge attempts are made only if the AC line voltage is within specification. There is a limit of 3 consequtive precharge timeouts after which the drive will be blocked.<br><br>The voltage threshold is 80% of the actual rectified AC line voltage.<br><br>*Note: There is a minor bug with the SVT display for this fault. The fault response in the SVT is shown as WARN, when it is actually ESTOP.* |
| 703 S Rly Fault | E4 | The normally-open S1 contact was in the wrong state.<br>See SVT parameter SX Pick Time ms. |
| 704 DBD Fault | E4 | One or more of the normally-closed contacts of S1, S2, BY1 and BY2 were in the wrong state. Three attempts are allowed before the drive is blocked.<br>See SVT parameter SX Pick Time ms. |
| 705 E2 Invalid | E | The data in the EEPROM is set to values incompatible with the current SCN or new EEPROM parameters have not yet been set. The invalid or blank values must be corrected. Pressing SHIFT_ENTER tells which parameter is invalid and what menu it is located. |
| 706 E2 Write Lim | W | The allowable number of writes to the EEPROM have been exceeded:<br>Metric writes: 100,000 maximum<br>Event writes: 1,000,000 maximum |
| 707 ADC Offset | C | The ADC offset variance is greater than the 2.9% of the ADC full scale, or the ADC gain variance is greater than 6.5%. There may be a problem with the analog circuitry. The fault is checked only when drive state <= IDLE. This fault sets the SAS flag and sends the drive state to SHUTDOWN until the fault clears.<br>See SVT parameter: ADC:gain% offset |
| 708 Cmd to Abort | D | **Applicable only for Interface Type 1.**<br>The run has been terminated with timed deceleration by an OPB command (DriveRunCommand dir=none). This fault does NOT result in SHUTDOWN. |
| 709 PRS SigNoise | D | **Applicable only for Interface Type 1.**<br>Too many PRS signal transitions have occurred over a fixed period of time. |
| 710 UIB DIB Err | E | **Applicable only for Interface Type 1.**<br>The UIB and DIB inputs were not consistent with the run command from TCBC-type controller. This fault sets the SAS flag. |

| | | |
|---|---|---|
| 711 DBD Shutdown | S | Three attempts were made to try to correct a relay in the wrong state (one or more of the normally-closed contacts of S1, S2, BY1 and BY2 were in the wrong state). The drive is blocked from further runs. |
| 712 PostTrq Time | W | A log only fault is reported when the current is not ramped down to zero within a specified time. |
| 713 Block by xxx | S | The drive has been blocked from further runs. This occurs after certain critical faults have been detected, indicated by "S" in this table, or when certain faults have exceeded an allowed number of occurrences, indicated in this table by the number that follows the fault response category. The blockage must be cleared following the guidelines in Section 6.4.3.<br>This fault sets the SAS flag. |
| 714 B_MODE Err | W | **Applicable only when Interface Type = 2 or 3.**<br>This fault is logged when "B_MODE" was not detected in less than 200ms from the time when the drive received some fault of "201 Cnv Id Error/ 202 Cnv Iq Error/208 Bus Cap Fail/305 PLL Unlock" or detected DC Bus voltage less than 650V. |
| 715 ARO BatPower | D | Applicable only in CAN-architecture. The power drawn from the battery during an MRO/ARO run was too high, e.g. > 15A * 48V for 800ms. |
| 716 Illegal Cmd | W | **Applicable only for Interface Type 1 with systems using GECB where CarController ICD >= 10, see "CAN ICD type" in M-1-8 ENGINEERING.**<br>An unexpected command has been received in a state where it could not be executed. It was ignored. Note it is possible that a GECB command coincides with a state change in the drive making execution of that command impossible. In such a case, this warning does not indicate a problem with the system.<br>*Maskable via parameters "MaskOut Warning1" and 2.* |
| 717 Triac Stuck | E | **Applicable only for Interface Type 1.**<br>This fault is logged if both triacs are disabled and safety chain feedback is in the active state. It is not checked during ARO(EN) runs. |
| 718 PRS Config | C | **Applicable only for Interface Type 1.**<br>This fault indicates illegal configuration of the PRS. Causes (see M-3-2):<br>• "offset mm" for a sensor is outside "Vane Length mm" (<- Test Variable 2 = 1)<br>• no DZ configured, i.e. "LV1 config 0/1/2"=0 and "LV2 config 0/1/2"=0, (<- Test Variable 2 = 2)<br>• gap between 2 sensors configured <5mm or sequence of sensor positions violated. Required sequence UIS > LV1 > LV2 > DIS |
| 719 OARO Blocked | I | The pilot AR relay for AR1/AR2 contacts is welded ON. If this fault is reported, then optimized ARO functionality is blocked, but normal runs are enabled. The controller will parse this code and request service via REM. |
| 720 Welded BLV | I | The BLV contact is welded. This means that the drive will allow ARO runs and normal runs; however the drive will be unable to completely shut down power after an ARO run. This causes deep discharge of batteries if the power outage persists (shorter life time and unavailability of ARO) and it needs to be fixed. The controller will request service via REM. |
| 721 PwmExistsFlt | | **Reserved for Ultra drive.** |
| 722 E2 Read CkSm | | **Reserved for Ultra drive.** |
| 723 UCM in Run | C | **Applicable only for Interface Type 1 and UCM-EN on/off = 1.**<br>Indicates that the car has run out of the door zone with open doors!<br>Note: This fault triggers a blockage which may only be cleared by authorized personnel after appropriate investigation of the UCM fault causing the blockage. It cannot be cleared by a power cycle, it can be cleared by an ERO run or by SVT. |

| | | |
|---|---|---|
| 724 UCM in Slide | C | **Applicable only for Interface Type 1 and UCM-EN on/off = 1.**<br>Indicates that the car has slid out of the door zone with open doors after an ESTOP has aborted a run inside the DZ.<br>Note: This fault triggers a blockage which may only be cleared by authorized personnel after appropriate investigation of the UCM fault causing the blockage. It cannot be cleared by a power cycle, it can be cleared by an ERO run or by SVT. |
| 725 UCM BrkBlock | C | **Applicable only for Interface Type 1.**<br>Indicates that the UCM-EN brake monitoring has detected a fault potentially compromising the ability of the brake to hold the car.<br>Note: This fault triggers a blockage which may only be cleared by authorized personnel after appropriate investigation of the brake fault causing the blockage. It cannot be cleared by a power cycle, it can be cleared by an ERO run or by SVT. |
| 726 Tmout SfcMsg | C | **Applicable only for Interface Type 1 and UCM-EN on/off = 1.**<br>Indicates a timeout of the communication of the SafetyChainSignals (used by UCM-EN) from the GECB. No further run will be started until the communication is re-established. |
| 727 TOStp SfcMsg | D | **Applicable only for Interface Type 1 and UCM-EN on/off = 1.**<br>Indicates that a timeout according to 726 has caused the abortion of a run by timed deceleration. This reaction is shown if 726 Tmout SfcMsg occurs while the the UCM monitoring is active (open door with DBP active). |
| 728 Slack Rope | C | **Applicable only when Load Weigh Type = 2 and for Interface Type =1.**<br>This fault indicates some ropes have trouble or are out of the driving sheave. The drive checks load data from Hitch Load Sensor for each rope. If the load data is very low compared with Normal data, an event of 728 Slack Rope is detected. Then the elevator is not able to run until serviced by engineer. Only the Inspection running is allowed for rescue operation even if the “Slack rope” is not solved.<br>This function is enabled by the parameter Num LwSensorData. |
| 729 SysTrip OCBT | | Reserved for Low Voltage Drive. |
| 730 S2 RlyFault | | Reserved for Low Voltage Drive. |
| 731 PX RlyFault | E4 | **Applicable to 430ML drive only.** |
| 732 MX RlyFault | E4 | **Applicable to 430ML drive only.** |
| 733 No Q4 Reset | | **RSERVED for ACD5** |
| 750 ARU Failure | I | ARO failed to operate. If the drive initiates OARO but the controller does not respond within a certain time, the drive aborts the OARO attempt, drops the Battery Low Voltage (BLV) relay. The drive attempts this 3 tiems. If it fails after 3 attempts, the drive logs a “750 ARU Failure” and sends to the controller as an alert when normal power recovers.<br>Check the battery voltage and make sure the batteries are not dead. Make sure the batteries are connected. |
| 751 Dischrg Batt | I | A discharged battery condition is detected when the drive enters into an ARO mode and realizes that the voltage is lower than 45 volts for ARU R1 and 90 volts for ARU R2. The response is not to execute ARO. This happens if the battery is over used and the drive expects that the charger will resume the voltage. No blockage is done.<br>The batteries may have to be replaced. |

| | | |
|---|---|---|
| 752 Bat Chrg Flt | I | A failed battery charger board was detected during the pre-qualification charging phase of the ARU battery. The GDCB monitors the duty cycle of the Charger Status signal from the battery charger board after each power up. If the signal is missing (ARU1 and ARU2), or the duty cycle of this signal is equal to 50% +/-1% over a 2 minute period (ARU2 only), the GDCB logs a “752 Bat Chrg Flt” and sends it to the controller as an alert. Check connections to the battery charger board. The battery charger board may have to be replaced. |
| 760 Missing Batt | I | Reserved for OARO. |
| 761 Batt Tmp Flt | I | This fault is reported if the battery temperature sensor is disconnected or a high (or too low) temperature condition existed more than 5 minutes. Check the battery temperature sensor. |
| 762 Batt Flt | I | The battery charger discrete signal BAT-FAULT is ON. The bit is checked during normal operation, and not checked during OARO. Fault indicates battery is absent or over-voltage fault, or a charging fault has occurred.<br>If fault (ALARM):<br>1) If OARO condition is commanded, OARO will activate.<br>2) Self clearing fault. No notification sent if cleared.<br>3) Charger remains connected.<br>4) Normal Operation and OARO operation not effected.<br>5) Not reported unless ON more than 5-10 minutes.<br>6) If remains active, will be re-reported 5-10 minutes after any run. (Not reported every run if time not elapsed) |
| 763 Welded ARx | I | The pilot AR relay for AR1/AR2 contacts is welded ON. If this fault is reported, then optimized ARO functionality is blocked, but normal runs are enabled. An alarm is sent to the controller. |
| 764 ARO Alarm CR | I | This event is sent to REM central via the controller to clear any alarm that was created during the operation of ARU. |
| 765 LVD Prechrg | | Reserved for Low Voltage Drive. |
| 770 24VsupplyFlt | E4 | Applicable to 430ML drive only. |
| 771 VintSuplyFlt | E4 | Applicable to 430ML drive only. |
| 772 Prechrg Fail | E2 | Applicable to 60A V3 and 430ML drive only.<br>This fault is declared when the DC bus voltage fails within the first 2 seconds of pre charge to increase sufficiently. This is indicating that either the DC bus is short circuited or that the Precharge circuit is open circuited.<br><br>For both MCSS and CAN systems, the drive shall declare this fault if the DC bus does not charge to the defined voltage threshold within 2 seconds from the moment PX relay is commanded to be picked.<br><br>The first fault shall trigger the precharge sequence to stop immediately and this fault to be reported. One retry is attempted automatically after a 30 second wait. If the retry fails then the drive is to be Blocked.<br><br>The voltage threshold is 25% of the actual rectified AC line voltage.<br><br>This fault is only applicable for normal operation with power coming from the AC line. It is not included in operations such as ARO or other cases when the drive is powered from a battery (or in PWM Open Mode). |

### 6.4.18 Task Overrun Faults

| SVT Display | | Description |
|---|---|---|
| 800 1ms Task | S | The 1 ms task overran. Contact Enigineering. |
| 801 10ms Task | S | The 10 ms task overran. Contact Enigineering. |
| 802 40ms Task | S | The 40 ms task overran. Contact Enigineering. |
| 803 Cnv Task | S | The Converter task overran. Contact Enigineering. |
| 804 Inv Task | S | The Inverter task overran. Contact Enigineering. |
| 805 200ms Task | S | The 200ms Task Overran. Contact Enigineering. |
| 806 Illegal Pwm | E3 | Applicable to 430ML drive only. |

### 6.4.19 Communication Faults

| SVT Display | | Description |
|---|---|---|
| 900 MCSS Timeout | E | **Applicable only for Interface Type 0, 4.**<br>Valid MCSS communication has not been received for 80 msecs. |
| 901 SVC Tool Err | W | Service tool communication error detected via the local service tool port.<br>*Maskable via parameters "MaskOut Warning1" and 2.* |
| 902 CAN Err | W | **Applicable only for Interface Type 1.**<br>CAN communication error detected.<br>*Maskable via parameters "MaskOut Warning1" and 2.* |
| 903 E2 CommWrite | W | An error occurred when writing to the EEPROM device.<br>*Maskable via parameters "MaskOut Warning1" and 2.* |
| 904 LWSS Timeout | W | **Applicable only for Interface Type 1 and Load Weigh Type is set to 1 or 2.** The drive has not received a loadweigh message within a certain time. The fault is cleared when a valid LW message is received.<br>*Maskable via parameters "MaskOut Warning1" and 2.* |
| 905 LWSS Bad Val | W | **Applicable only for Interface Type 1 and Load Weigh Type is set to 1 or 2.** The drive received an erroneous value in the loadweigh message.<br>**Load Weigh Type = 1 :**<br>The drive received the full scale value for load percent from the LWB2. The load percent value can be checked in the SVT menu of the LWB2.<br>**Load Weigh Type = 2 :**<br>The drive received the full scale value for the hitch load measured in kg from the Hitch LW device. The value can be checked in the menu Monitor-Motion, it is the first value in the display " HitchLW: Empty: "<br>The fault is cleared when a valid LW message is received.<br>*Maskable via parameters "MaskOut Warning1" and 2.* |
| 906 No LS Msg | NC | **Applicable only for Interface Type 1.**The drive has not receieved the DriveHoistwaySignal message for 3 seconds.<br><br>This fault is used to decide if the NEXT COMMITTABLE fault response shall continue. If this fault is not detected with a certain time, or the fault "511 1LS & 2LS !" is not detected within a certain time, then the fault response is changed from NEXT COMMITTABLE to TIMED DECEL. |
| 907 Primary CRC | W | The drive application performs a CRC of the primary loader and this value does not match the value computed by the conversion utility. |
| 908 Drive CRC | S | The drive application performs a CRC of the drive software and this value does not match the value computed by the conversion utility. |
| 909 CAN BusOff | W | **Applicable only for Interface Type 1, 4.**<br>The CAN controller of the drive has shut itself down due to a persistent communication problem on the CAN bus or CAN power failure (broken connection). |
| 910 CAN OPB_Init | W | **Applicable only for Interface Type 1.**<br>Initialization of the CAN communication software has failed. |

| | | |
|---|---|---|
| 911 CAN TxQ Full | W | **Applicable only for Interface Type 1, 4.**<br>Overflow in the transmit queue of the CAN port, messages have been lost. |
| 912 No FloorInfo | W | **Applicable only for Interface Type 1.** Neither the SPBC nor the GECB have sent valid position in return to the request by the drive (timeout 200ms after request for SPBC, 200ms after its StartUp message for GECB). |
| 913 MCSS Warning | W | **Applicable only for Interface Type 0.**<br>MCSS Communication error detected. It includes Checksum, Framing, Parity or invalid format. |
| 914 Power E2 Err | S | **Applicable only to drives with eI2C EEPROM storage capability.**<br>The power section could not be identified because bad or undefined drive code data has been read from the EEPROM on power section board 1 (PBX_INV, PBX_BIDI(I), HVIB, HVIB_II).<br>This check is only performed at power on. |
| 915 LWSS not cal | W | **Applicable only when Interface Type = 1.**<br>**Applicable only when** `Load Weigh Type` **= 2.**<br>Hitch load weighing device not calibrated. The calibration is done during a learn run. |
| 916 Power E2 Rng | S | **Applicable only to drives with eI2C EEPROM storage capability.**<br>This fault is logged if bad data in one of the power section EEPROMs have been detected:<br>- calibration values are undefined or out of range for the specified drive type,<br>- customized converter-related data (if defined) are out of range.<br>This check is only performed at power on. |
| 917 CPLD Ver Flt | E1 | The CPLD version is not compatible with either the HVIB EERPROM or the GDCB EEPROM parameter setting. See the table below for erroneous combinations. |
| 918 ARO Ver Flt | E1 | This event indicates an incompatibility between the Primary Loader and the CPLD version in case of an optimized ARO system. The Primary Loader must be version AAA31013CAE or later and the CPLD must be version 9 or greater. This event occurs if either is not satisfied for an optimized ARO system. |
| 919 Powrbrd miss | S | One or more required power section boards are missing (bad or no response from their EEPROM's).<br>Note that at least one power board (e.g. HVIB) is required even for drives w/o eI2C EEPROM storage capability. For 60A/120A/160A V.2 – drives three power boards are required.<br>This check is only performed at power on. |
| 920 Micro ChkSum | | **Reserved for Ultra Drive.** |
| 921 FPGA ChkSum | | **Reserved for Ultra Drive.** |
| 922 FLASH Warn | | **Reserved for Ultra Drive.**<br>*Maskable via parameters "`MaskOut Warning1`" and 2.* |
| 923 FPGA Warn | | **Reserved for Ultra Drive.**<br>*Maskable via parameters "`MaskOut Warning1`" and 2.* |
| 924 Micro War | | **Reserved for Ultra Drive.**<br>*Maskable via parameters "`MaskOut Warning1`" and 2.* |
| 925 No CAN-PRS | C | Requested PrsSignals CAN messages are not received. While the fault persists, only ERO and MRO runs are allowed. |
| 926 CAN PRS Msg | W | A discontinuity in the CAN PrsSignals was detected; a message may have been lost.<br>*Maskable via parameters "`MaskOut Warning1`" and 2.* |
| 927 DSP2FPGA Wrn | | **Reserved for Ultra Drive.** |
| 928 DSP2FPGA Flt | | **Reserved for Ultra Drive.** |

| | | |
|---|---|---|
| 929 UCMP Timeout | C | **Applicable only when Interface Type = 1 and "JIS Function 0/1" = 1.**<br>This is disconnected with UCMP module or has a CAN communication fault with UCMP.<br>If you use the "JIS function" without UCMP module, "JIS Option Mode" is set to "60" only for Rescue or any test. |
| 930 PRS TrnsSkip | W | **A PRS signal transition was skipped.**<br>This fault could be logged if a CAN PrsSignals msg is lost or if one sensor signal is delayed, sequence inverted.<br>*Maskable via parameters "MaskOut Warning1" and 2.* |
| 931 Micro VerFlt | | **Reserved for Ultra Drive.** |
| 932 SBSB Fault | C | **Applicable only when drive OVFR02A-412**<br>If "Sequenced Brk0/1" = 1 or "Motor Type " = 511:<br>The signal sent to SBSB board via 24V I/O P6.6 is not identical with the signal received from SBSB via 24V I/O P5.5: Either the SBSB is defect or the communication between GDCB and SBSB is interrupted. |
| 933 PosTimeStamp | W | **RESERVED**<br>**Applicable only for Interface Type 1.**<br>The drive has received a position message (APRS or Vanes over CAN) with a time stamp out of range. This could indicate e.g. that a node had sent a message older than 1sec. |
| 934 APRS timeout | C | **RESERVED**<br>**Applicable only for Interface Type 1 and Vane Sensor Type 88.**<br>No valid APRS messages were received for >1sec. |
| 935 AHC comm flt | W | **Applicable to "AHC Enable 0/1"= 1 only**<br>This warning occurs when there is an issue with the 422 communication between the AHC top of car board and the machine-room drive. If this warning occurs, the "AHC Permissive" is removed (set to 0). The "AHC Permissive" is not restored until 422 communications is re-established and this warning clears. If this warning occurs:<br>• Check that the top of car board has power<br>• Check the top of car board 422 transmit signal connections<br>Check the machine room drive 422 receive signals |
| 936 FloorTabCnfl | D | **RESERVED**<br>**Applicable only for Interface Type 1 and Vane Sensor Type 88.**<br>External messages potentially overwrote floor table data that had internally been modified in a learn routine**.** |
| 937 FloorTabPubl | W | **RESERVED**<br>**Applicable only for Interface Type 1 and Vane Sensor Type 88.**<br>Published floor table data was potentially inconsistent**.** |
| 938 FT TopBotBad | W | **RESERVED**<br>**Applicable only for Interface Type 1 and Vane Sensor Type 88.**<br>Top or bottom floor parameter in drive are different from the parameters in the system floor table -> no NORMAL runs possible**.** |
| 939 FT E2 writes | W | **RESERVED**<br>**Applicable only for Interface Type 1 and Vane Sensor Type 88.**<br>The rate of table writes to E2PROM has exceeded 100 per 10days, or the total number of writes has exceeded 80000. => a new table is stored to E2 only after 10hours of stability. |
| 940 FT CRC bad | W | **RESERVED**<br>**Applicable only for Interface Type 1 and Vane Sensor Type 88.**<br>The checksum of the floor table content does not match the expectation: no NORMAL runs while condition persists. |
| 950 Tandem Warm | | **Reserved for Tandem drives** |
| 951 Tandem Comm | | **Reserved for Tandem drives** |

| | | |
|---|---|---|
| 952 Drv x Comm | | **Reserved for Tandem drives** |
| 953 Drv x Estop | | **Reserved for Tandem drives** |
| 954 Drv x SAS | | **Reserved for Tandem drives** |
| 955 Drv x Temp | | **Reserved for Tandem drives** |
| 956 Drv x Warn | | **Reserved for Tandem drives** |
| 957 Drv x Block | | **Reserved for Tandem drives** |
| 958 Drv x Limit | | **Reserved for Tandem drives** |
| 959 DisInfo Miss | W | **Applicable only to ACD5 system**<br>This event is logged if drives does not receive a specific CAN message from controller that contains the status of discretes and safety faults. Drive will try to request this information from the controller periodically if the status and fault information is not received. |
| 960 SF Write Lim | W | **Applicable only to Ultra Drives**<br>The allowable number of writes to the Serial Flash have been exceeded: This limit is tracked as part of event log and parameter back up feature Limit is 100,000 |

| CPLD Version | HVIB EEPROM Present | "Drive Type" SVT Parameter | Fault Response |
|---|---|---|---|
| 128 | 0 | 234/416/428/460 | No Fault |
| 128 | 1 | X | 917 CPLD Ver Flt |
| 128 | 0 | NOT 234/416/428/460 | 917 CPLD Ver Flt |
| NOT 128 | 0 | X | 918 Powrbrd miss |
| NOT 128 | 1 | 416/428/460 | 917 CPLD Ver Flt |
| < 8 OR >128 | X | X | 917 CPLD Ver Flt |

## 6.5 Central Failure Management

The CFM is supported by sending a

- CfmSystemEvent messages after the occurrence of every event.
- CfmSystemEventText message in case of a blockage.

The CFM messages support the "ALL Menu"
The "ALL Menue" provides

- A common error logging of all subsystems.
- A possibility to clear all event logs together
- In case of a blockage the source and a text string are displayed
- If the blockage is clearable it can be cleared

### 6.5.1 Plug & See

In case of a blockage by any subsystem the servicetool may be plugged in. It displays the "All Menu" automatically with the

- Source (blinking in the first row)
- Text String (scrolling through the second row)
- If clearable, it can be cleared by "shift 5"

Every event with a defined number of retries may lead to a blockage. The following text messages are provided by the drive:

| Event message | Retries allowed | Source | Text String |
|---|---|---|---|
| “100 Inv SW Oct “ | 4 | DRIVE, | High inverter current detected by software |
| “101 Inv I Imbal “ | 4 | DRIVE, | Asymmetric inverter current |
| “102 Inv Id Error” | 4 | DRIVE, | High inverter current (field) regulator |
| “103 Inv Iq Error” | 4 | DRIVE, | High inverter current (torque) regulator |
| “107 Inv Gate Flt” | 4 | DRIVE, | Inverter IGBT gate supply voltage fault |
| “108 Inv HW Oct “ | 4 | DRIVE, | High inverter current detected by hardware |
| “109 Overload “ | 4 | DRIVE, | Motor current overload |
| “111 No Id fdbk “ | 4 | DRIVE, | Motor phase – no current (field) |
| “112 No Iq fdbk “ | 4 | DRIVE, | Motor phase – no current (torque) |
| “113 Inv IPM Flt “ | 4 | DRIVE, | Inverter intelligent power module fault |
| “114 Curr Ovrload” | 4 | DRIVE, | Current overload |
| “115 Brk Chop Err” | 4 | DRIVE, | Brake chop error |
| “116 Inv HW Ovt “ | 4 | DRIVE, | High DC link voltage detected by hardware |
| “117 Inv Pfai Flt” | 4 | DRIVE, | Inverter PWM activity during IDLE |
| “118 Overload Dec” | 4 | DRIVE, | Motor current overload |
| “119 Desat Err “ | 4 | DRIVE, | High current on OVF4xx drive detected by hardware |
| “121 SR1 Err “ | 4 | CONTACTOR, | SR1 relay of OVF4xx drive in the wrong state during run |
| 122 Inv DeSat | 4 | DRIVE | High current on inverter side detected by gate drive |
| 123 CnvOverload | 4 | DRIVE | Converter Overload |
| “200 Cnv SW Oct “ | 4 | DRIVE, | High converter current detected by software |
| “201 Cnv Id Error” | 4 | DRIVE, | High converter current (field) control error |
| “202 Cnv Iq Error” | 4 | DRIVE, | High converter current (torque) control error |
| “205 Cnv Gate Flt” | 4 | DRIVE, | Converter IGBT gate supply voltage fault |
| “206 Cnv HW Oct “ | 4 | DRIVE, | High converter current detected by hardware |
| “207 Cnv Gnd Flt “ | 1 | DRIVE, | Converter ground fault |
| “208 Bus Cap Fail” | 1 | DRIVE, | High power loss – check DC link capacitor |
| “209 DC Link OCT “ | 1 | DRIVE, | High DC link current |
| “210 Cnv IPM Flt “ | 4 | DRIVE, | Converter intelligent power module fault |
| “211 Battry Chrgd” | 4 | DRIVE, | Battery charging during ARO |
| 214 Cnv DeSat | 4 | DRIVE | High current on converter side detected by gate drive |
| “300 DC Bus Over “ | 3 | DRIVE, | High DC link voltage OR battery over-voltage |
| “301 DC Bus Under” | 6 | DRIVE, | Low DC link voltage OR low battery voltage |
| “302 VAC Over “ | 0 | DRIVE, | High AC line voltage |
| “303 VAC Under “ | 0 | DRIVE, | Low AC line voltage |
| “304 VAC Imbal “ | 0 | DRIVE, | AC line voltage imbalanced |
| “305 PLL Unlock “ | 0 | DRIVE, | PLL on AC line frequency unlocked |
| “306 Single Phase” | 1 | CONTACTOR, | Wrong phase wiring in Single Phase mode |
| “308 Welded Mx/Px” | 1 | DRIVE, | DC link voltage not 0 – check for welded Mx or Px relay |
| “400 Brake S1 SAS” | 4 | BRAKE, | Brake switch BS1 fault |
| “401 Brake S2 SAS” | 4 | BRAKE, | Brake switch BS2 fault |
| “402 Brake Status” | 4 | BRAKE, | Brake status feedback disagrees with brake command |
| “403 Brake BY “ | 4 | BRAKE, | BY energized before lift brake command |
| “404 Brake I Off “ | 4 | BRAKE, | Brake current measurement fault – high offset |
| “405 Brake I Drop” | 4 | BRAKE, | High brake current during stop |
| “406 Brake I Hold” | 4 | BRAKE, | Low brake current during run |

| | | | |
|---|---|---|---|
| “407 Brake I Max “ | 4 | BRAKE, | High brake current during run |
| “408 Brk S1 ESTOP” | 4 | BRAKE, | Brake switch BS1 fault – emergency stop |
| “409 Brk S2 ESTOP” | 4 | BRAKE, | Brake switch BS2 fault – emergency stop |
| “411 Brk S1 DECEL” | 4 | BRAKE, | Brake switch BS1 fault – Deceleration stop |
| “412 Brk S2 DECEL” | 4 | BRAKE, | Brake switch BS2 fault – Deceleration stop |
| “413 Bk Desat Err” | 4 | BRAKE, | Brake PWM: high current detected by hardware |
| “416 Bk fbk tmout” | 4 | BRAKE, | Brake pick or drop control timeout |
| “417 Bk SW Oct ” | 4 | BRAKE, | Brake PWM: high current detected by software |
| “421 Bk Dly DecE” | 1 | BRAKE, | Brake pick or drop control timeout |
| 422 Brk ShrtCrkt | 4 | BRAKE | Brake short circuit detected |
| “423 Brk I State “ | 4 | BRAKE | Brake current detected before lift brake command |
| “424 Brake I Neg “ | 4 | BRAKE | Negative brake current detected |
| "431 Brk S3 ESTOP" | 4 | BRAKE | Brake switch BS3 fault - emergency stop |
| "432 Brk S4 ESTOP" | 4 | BRAKE | Brake switch BS4 fault - emergency stop |
| "433 Brk S5 ESTOP" | 4 | BRAKE | Brake switch BS5 fault - emergency stop |
| "434 Brake S3 SAS" | 4 | BRAKE | Brake switch BS3 fault |
| "435 Brake S4 SAS" | 4 | BRAKE | Brake switch BS4 fault |
| "436 Brake S5 SAS" | 4 | BRAKE | Brake switch BS5 fault |
| "**437** Bk UCM Relay" | 4 | BRAKE | Brake UCM Relay Drop and EBrake Fault |
| “500 Overspeed “ | 4 | DRIVE ENCODER, | Motor overspeed |
| “501 Pos Tracking” | 4 | DRIVE ENCODER, | Position tracking error |
| “502 Vel Tracking” | 4 | DRIVE ENCODER, | Velocity tracking error |
| “503 LRT Motion “ | 4 | BRAKE, | Motion detected while brake should be closed |
| “511 1LS & 2LS !” | 0 | POSITIONREF, | 1LS & 2LS active |
| “512 Missing Vane” | 3 | POSITIONREF, | Low-to-high vane transition missing |
| “513 No PRS Trans” | 3 | POSITIONREF, | High-to-low vane transition missing |
| “514 Enc <> Vane “ | 3 | POSITIONREF, | Unexpected low-to-high vane transition |
| “517 DDP Error “ | 1 | DRIVE, | DDP – No vane transition within DDP time limit |
| “524 No Enc Signl” | 0 | DRIVE ENCODER, | Encoder channel A input not detected |
| “529 No enc fdbck” | 4 | DRIVE ENCODER, | No encoder feedback after motor started movement |
| “530 No enc tmout” | 4 | DRIVE ENCODER, | No encoder feedback within timeout |
| “539 LvTransUnclr” | 3 | POSITIONREF, | Unexpected LV transition |
| “542 Decel Req Fl” | 4 | DRIVE, | Estop due to failed deceleration |
| “544 Torq Obs Flt” | 3 | DRIVE, | Torque Observer Fault |
| 556 APRS step | 4 | DRIVE | Absolute PRS had discontinuity step vs. machine encoder |
| 557 130% Mtr Frq | 4 | DRIVE ENCODER | SVT Param exceed 130% of Max Mtr Freq |
| 558 150% Mtr Frq | 4 | DRIVE ENCODER | Speed Command exceed 150% of Max Mtr Freq |
| “601 Inv Tmp Over” | 0 | DRIVE, | Inverter over-temperature |
| “602 Inv Tmp Fail” | 0 | DRIVE, | Temperature sensor failed on inverter |
| “604 Cnv Tmp Over” | 0 | DRIVE, | Converter over-temperature |
| “605 Cnv Tmp Fail” | 0 | DRIVE, | Temperature sensor failed on converter |
| “606 Mtr Tmp Over” | 0 | DRIVE, | Motor over-temperature |
| “607 Reactor Temp” | 0 | DRIVE, | Line reactor over-temperature |
| “608 DBR Tmp Over” | 0 | DRIVE, | DBR over-temperature or parameter DBR Mode |
| 611 MTC/RTC Flt | 0 | DRIVE | Over-temperature of motor, line reactor, or DBR |
| “612 Inv IGBT tmp” | 4 | DRIVE | Inverter IGBT junction temperature over safe op limit |

| | | | |
|---|---|---|---|
| "614 HSl Tmp Over" | 0 | DRIVE, | Lower heatsink over-temperature |
| "615 HSl Tmp Fail" | 0 | DRIVE, | Temperature sensor failed on lower heatsink |
| "617 HSu Tmp Over" | 0 | DRIVE, | Upper heatsink over-temperature |
| "618 HSu Tmp Fail" | 0 | DRIVE, | Temperature sensor failed on upper heatsink |
| “702 Prechrg Time” | 3 | DRIVE, | DC link not precharged within time limit |
| “703 S Rly Fault “ | 4 | DRIVE, | S1 relay in the wrong state |
| “704 DBD Fault “ | 4 | CONTACTOR, | DBD fault |
| “705 E2 Invalid “ | 0 | DRIVE, | Drive parameter invalid |
| “707 ADC Offset “ | 0 | DRIVE, | ADC offset out of range |
| “710 UIB DIB Err “ | 0 | DRIVE, | UIB/DIB inputs not consistant with run commands |
| “711 DBD Shutdown” | 1 | CONTACTOR, | DBD fault |
| “717 Triac Stuck “ | 0 | DRIVE, | Unexpected 110VAC on safety chain output |
| “718 PRS Config “ | 0 | POSITIONREF, | Illegal configuration of PRS |
| "721 PwmExistsFlt" | 4 | DRIVE, | Inverter PWM status disagrees with safety chain input |
| “723 UCM in Run “ | 0 | DRIVE, | UCM blockage: motor on & car left DZ with open door |
| “724 UCM in Slide” | 0 | DRIVE, | UCM blockage: brake dropped & car left DZ with open door |
| “725 UCM BrkBlock” | 0 | DRIVE, | UCM blockage: because of brake failure |
| “726 Tmout SfcMsg” | 0 | DRIVE, | Drive did not receive SafetyChainSignal CAN msg for UCM |
| “728 Slack Rope “ | 1 | LOAD, | Low value of one Hitch Load Sensor indicates Slack Rope |
| 730 S2 RlyFault | 4 | DRIVE | S2 relay in the wrong state |
| 731 PX RlyFault | 4 | DRIVE | PX relay in wrong state (cmd vs. fbk mismatch) |
| 732 MX RlyFault | 4 | DRIVE | MX relay in wrong state (cmd vs. fbk mismatch) |
| 770 24VsupplyFlt | 4 | DRIVE | 24V drive voltage supply is missing or failed |
| 771 VintSuplyFlt | 4 | DRIVE | Internal drive voltage supply is missing or failed |
| 772 Prechrg Fail | 2 | DRIVE | PreCharge Fail |
| “800 1ms Task “ | 1 | DRIVE, | Software 1ms task overrun |
| “801 10ms Task “ | 1 | DRIVE, | Software 10ms task overrun |
| “802 40ms Task “ | 1 | DRIVE, | Software 40ms task overrun |
| “803 Cnv Task “ | 1 | DRIVE, | Software converter task overrun |
| “804 Inv Task “ | 1 | DRIVE, | Software inverter task overrun |
| “805 200ms Task “ | 1 | DRIVE, | Software 200ms task overrun |
| “908 Drive CRC” | 1 | DRIVE, | Software checksum fault |
| “914 Power E2 Err” | 1 | DRIVE, | Power section not identified – E2P data incorrect |
| “916 Power E2 Rng” | 1 | DRIVE, | Bad or missing calibration of Power section |
| “917 CPLD Ver Flt” | 1 | DRIVE, | CPLD version fault |
| “919 Powrbrd miss” | 1 | DRIVE, | Power section boards are missing or not responding |
| 932 SBSB Fault | 0 | DRIVE | SBSB board fault or not connected |
| 938 FT TopBotBad | 0 | DRIVE | Drive's top/bottom params disagree w/ system floor table |
| 940 FT CRC bad | 0 | DRIVE | Floor table calculated CRC disagrees with received CRC |

## 6.6 Service Tool Parameters

The following table shows all the service tool parameters with their default, minimum and maximum values, as well as the SVT access level. Where indicated, the default values should be used. If a default value is not specified, the parameter should be set according to the contract. Detailed descriptions for each are in the next section.

**( * )Note: Not always visible.**

| 31 CONTRACT | Min | Max | Default | Actual | Access Level |
|---|---|---|---|---|---|
| Interface Type | 0 | 4 | - | | 2 |
| JIS Function | 0 | 2 | 0 | | 2 |
| *Duty Type | 1 | 9999 | | | 2 |
| *Drive Type | 15 | 9999 | - | | 2 |
| ARO Type | 1 | 5 | 1 | | 2 |
| *ARO Release? 1/2 | 1 | 2 | 1 | | 2 |
| *ARD Operation | 0 | 2 | 0 | | 2 |
| *ARO Delay Time s | 1 | 600 | 30 | | 2 |
| *ARO Time Max min | 3 | 60 | 5 | | 2 |
| *Bat Peak Curr A | 3 | 80 | 45 | | 2 |
| *Motor Type | 100 | 999 | - | | 2 |
| *Duty Speed mm/s | 10 | 16000 | - | | 2 |
| *Rated rpm | 1 | 5000 | - | | 2 |
| Inertia kg-m2 | 0.1 | 20000 | - | | 2 |
| *Encoder Type 0/1 | 0 | 1 | - | | 2 |
| *Enc termintn 1/2 | 1 | 2 | 2 | | 2 |
| *Encoder PPR | 1000 | 10000 | - | | 2 |
| *Duty Load kg | 10 | 16384 | - | | 2 |
| *AC Main Vrms | 50 | 480 | - | | 2 |
| *Load Weigh Type | 0 | 3 | - | | 2 |
| *Load Wgh Lvl 1 % | 0 | 120 | - | | 2 |
| *Load Wgh Lvl 2 % | 0 | 120 | - | | 2 |
| *Load Wgh Lvl 3 % | 0 | 120 | - | | 2 |
| *Load Wgh Lvl 4 % | 0 | 120 | - | | 2 |
| *Load Wgh Lvl 5 % | 0 | 120 | - | | 2 |
| *Balance % | 0 | 77 | 50 | | 2 |
| *Roping 1..4 | 1 | 4 | - | | 2 |
| *Vane Sensor Type | 0 | 99 | - | | 2 |
| *PRS via CAN 0/1 | 0 | 1 | 0 | | 2 |
| *DDP sec | 0 | 45 | 20 | | 2 |
| *ARD DDP sec | 270 | 600 | 270 | | 2 |
| *Number of DZ | 2 | 140 | - | | 2 |
| *Bottom DZ | 0 | 20 | 0 | | 2 |
| *DZ in 1LS | 0 | 20 | 1 | | 2 |
| *DZ in 2LS | 0 | 20 | 1 | | 2 |
| *LS Pos Recov 0/1 | 0 | 1 | 0 | | 2 |
| *ARO Bus Nom DC V | 40 | 210 | 180 | | 2 |
| *6LS-TYP 0/1 | 0 | 1 | 0 | | 2 |
| *6LS-TYP 0-2 | 0 | 2 | 0 | | 2 |
| *DBR Mode 0-3 | 0 | 3 | 0 | | 2 |
| *UCM-EN on/off | 0 | 1 | 1 | | 2 |
| *TwoStepSpeed 0/1 | 0 | 1 | 0 | | 2 |

| | | | | | |
|---|---|---|---|---|---|
| *DZ below 1DS | 0 | 5 | 2 | | 2 |
| *DZ above 2DS | 2 | MAX LANDINGS | - | | 2 |
| *SFC InWiring 0/1 | 0 | 1 | 0 | | 2 |
| *ERO type 0/1 | 0 | 1 | 0 | | 2 |
| *TCI Pos Limit | 0 | 1 | 0 | | 2 |
| **32 ADJUSTMENT** | **Min** | **Max** | **Default** | **Actual** | **Access Level** |
| *JIS Option Mode | 0 | 106 | 0 | | 2 |
| *StartShock LVL2% | 10 | 150 | 60 | | 2 |
| *Run Shock LVL% | 10 | 80 | 30 | | 2 |
| *EAR UP MtrI Arms | 3 | 700 | 40 | | 2 |
| *EAR Inv Lmt Arms | 5 | 700 | 40 | | 2 |
| *EAR Overload sec | 1 | 6 | 2 | | 2 |
| *EAR mtr OVL Arms | 3 | 300 | 24.0 | | 2 |
| *DBR ENE=1 DIS=0 | 0 | 1 | 0 | | 2 |
| Car Dir 0/1 | 0 | 1 | 0 | | 2 |
| *Motor Phase 0/1 | 0 | 1 | 0 | | 2 |
| *Single Phase 0-3 | 0 | 3 | 0 | | 2 |
| *AC SnglPh Main V | 50 | 480 | - | | 2 |
| *Start Gain Ot PU | 0.1 | 40 | 1 | | 1 |
| *Start filt BW PU | 0.1 | 20 | 1 | | 2 |
| *Start Gain In PU | 0.1 | 20 | 1 | | 2 |
| *SG Period sec | 0.01 | 2 | 0.3 | | 2 |
| *SG Ramp Down sec | 0.01 | 2 | 0.4 | | 2 |
| *End Gn Vel mm/s | 0 | 16000 | 0 | | 2 |
| Norm Vel Resp PU | 0.0 | 1.5 | 1 | | 2 |
| *Rele Vel resp PU | 0.1 | 2.0 | 1 | | 2 |
| Pretorque Trim % | 50 | 150 | 100 | | 2 |
| *Pretorque Trim2% | 0 | 100 | 100 | | 2 |
| *Pretorq Mod 0/1 | 0 | 1 | 0 | | 2 |
| *Track Error mm/s | 0 | 600 | 100 | | 2 |
| *No Enc VThrs PU | 0 | 1.0 | 0.2 | | 2 |
| *No enc flt t sec | 0 | 2.0 | 0.4 | | 2 |
| *Vel Notch1 Hz | 0 | 500 | 0 | | 2 |
| *Vel Notch2 Hz | 0 | 500 | 0 | | 2 |
| *Notch Band Hz | 0 | 50 | 2 | | 2 |
| *VelRate div 0..3 | 0 | 3 | 0 | | 2 |
| *Cnv Custom 0/1 | 0 | 1 | 0 | | 2 |
| *Cnv Notch Hz | 800 | 2500 | 1800 | | 2 |
| *Cnv crf Depth | 0 | 30 | 10 | | 2 |
| *Cnv crf Width | 0 | 2000 | 300 | | 2 |
| *Cnv BW PU | 0.5 | 1.0 | 0.7 | | 2 |
| *Dc V BW Hz | 1 | 100 | 50 | | 2 |
| *Cnv L mH | 0.01 | 100 | - | | 2 |
| *Cnv Saturation A | 0 | 1000 | 0 | | 2 |
| *Cnv L Slope uH/A | 0 | 1000 | 0 | | 2 |
| *Cnv R Ohm | 0.01 | 10 | - | | 2 |
| *Cnv TmpObsrv T s | 10 | 600 | 600 | | 2 |
| *Ploss Thr pre % | 0 | 100 | 3 | | 2 |
| *Ploss Thr idle % | 0 | 100 | 3 | | 2 |
| *Ploss Thr run % | 0 | 100 | 18 | | 2 |
| *Ploss Thrs Sng % | 0 | 100 | 30 | | 2 |

| | | | | | |
|---|---|---|---|---|---|
| *PLL freq band Hz | 0.1 | 60 | 3 | | 2 |
| *PLL freq time ms | 0 | 5000 | 500 | | 2 |
| *Cnv Vmag Thrs PU | 0 | 5 | 1.2 | | 2 |
| *Turnovr Delay ms | 0 | 5000 | 1000 | | 2 |
| *VaneBias (10) mm | 7.0 | 13.0 | 10.0 | | 2 |
| *Vane Hysteres mm | 0.0 | 20.0 | 1.0 | | 2 |
| *Profile Delay ms | 0 | 10000 | 0 | | 2 |
| *Relevel Delay ms | 0 | 5000 | 0 | | 2 |
| *Hover Enable 0/1 | 0 | 1 | 0 | | 2 |
| *HoverRangeTopLdg | 0 | 139 | 0 | | 2 |
| *Hover Min Time s | 0 | 500 | 30 | | 2 |
| *Hover Fade Out s | 0 | 500 | 10 | | 2 |
| *Hover delta LW % | 1 | 120 | 5 | | 2 |
| *Hover Gain PU | 1.0 | 3.0 | 1.0 | | 2 |
| *AHC Enable 0/1 | 0 | 1 | 0 | | 2 |
| *TOC Car Dir 0/1 | 0 | 1 | 0 | | 2 |
| *AHC Kp gain | 0.0 | 10.0 | - | | 2 |
| *AHC Kd gain | 0.0 | 5.0 | - | | 2 |
| *AHC Kd RedFactor | 0 | 4 | -1 | | 2 |
| *AHC Notch frq Hz | 0.0 | 2.3 | - | | 2 |
| *AHC Ln Enc Th mm | 0 | 2000 | - | | 2 |
| *AHC Nm Enc Th mm | 0 | 2000 | - | | 2 |
| *AHC Enc/Vn Th mm | 0 | 200 | - | | 2 |
| *Pos Stop Tol mm | 0 | 7 | 3 | | 2 |
| *Vel Stop mm/sec | 1 | 20 | 3 | | 2 |
| Overload sec | 0 | 40 | 6 | | 2 |
| *Rated mtr i Arms | 0 | 500 | =60% rated accel current | | 2 |
| *Rated 113inim PU | 1 | 5 | 1.67 | | 2 |
| *Inv I Limit % | 0 | 150 | 100 | | 2 |
| *Cnv I Limit % | 0 | 150 | 100 | | 2 |
| *SX Pick Time ms | 100 | 2000 | 100 | | 2 |
| *Pos Corr Lim mm | 0.01 | 50.0 | 0.05 | | 2 |
| *Max Battery I A | 0.01 | 100.0 | 30 | | 2 |
| *AroMRo Delay Sec | 10 | 120 | 10 | | 2 |
| *Vd out thresh PU | 0 | 1.0 | 0.9 | | 2 |
| *Id Thresh 400V | 4 | 10.0 | 9.0 | | 2 |
| *Id Thresh 700V | 0 | 5.0 | 4.0 | | 2 |
| *CUR Limit T(Sec) | 0 | 3.0 | 1.8 | | 2 |
| *DET SP MAX mm/s | 0 | 400 | 100 | | 2 |
| *ARO Vbus fil ms | 0 | 500 | 200 | | 2 |
| * ARO V Flt Dly s | 0 | 3.0 | 1.0 | | 2 |
| * ARO Vbus Under % | 0 | 100 | 80 | | 2 |
| *Start Shock LVL% | 10 | 150 | 150 | | 2 |
| *Stop Shock LVL% | 10 | 150 | 100 | | 2 |
| *NIARO Pdiv GAIN | 1.0 | 10.0 | 1.0 | | 2 |
| *Self Tune 0/1 | 0 | 1 | 0 | | 2 |
| *Vane Length mm | 10 | 1000 | - | | 2 |
| *UIS config 0/1/2 | 0 | 2 | - | | 2 |
| *UIS offset mm | 0 | 250 | - | | 2 |

| | | | | | |
|---|---|---|---|---|---|
| *UIS NO=0 / NC=1 | 0 | 1 | - | | 2 |
| *LV1 config 0/1/2 | 0 | 2 | - | | 2 |
| *LV1 offset mm | 0 | 250 | - | | 2 |
| *LV1 NO=0 / NC=1 | 0 | 1 | - | | 2 |
| *LV2 config 0/1/2 | 0 | 2 | - | | 2 |
| *LV2 offset mm | 0 | 250 | - | | 2 |
| *LV2 NO=0 / NC=1 | 0 | 1 | - | | 2 |
| *DIS config 0/1/2 | 0 | 2 | - | | 2 |
| *DIS offset mm | 0 | 250 | - | | 2 |
| *DIS NO=0 / NC=1 | 0 | 1 | - | | 2 |
| *Custom HwCmp 0/1 | 0 | 1 | 0 | | 2 |
| *Latcy UisDisOn % | 0 | 5000 | 100 | | 2 |
| *Latcy UisDisOff% | 0 | 5000 | 100 | | 2 |
| *Latcy 1/2LV on % | 0 | 5000 | 100 | | 2 |
| *Latcy 1/2LV off% | 0 | 5000 | 100 | | 2 |
| *RopeStrtch comp% | 0 | 1000 | 100 | | 2 |
| *HitchPress comp% | 0 | 1000 | 100 | | 2 |
| *Duty_kg % of car | 0 | 200 | 50 | | 2 |
| *PWM dnsft I % | 0 | 200 | 100 | | 2 |
| *PWM dnsftFreq Hz | 0 | 150 | 150 | | 2 |
| *Inv NTSD Ilimit% | 0 | 88 | 88 | | 2 |
| *ETSC Trip Vel % | 0 | 100 | 94 | | 2 |
| *SSB Trip Vel % | 0 | 100 | 90 | | 2 |
| *CZ Drop Time ms | 0 | 500 | 15 | | 2 |
| *HitchLw emptyBOT | 0 | 99999 | 0 | | 2 |
| *HitchLw emptyTOP | 0 | 99999 | 0 | | 2 |
| *HitchLw full BOT | 0 | 99999 | 0 | | 2 |
| *HitchLw CaliDone | 0 | 1 | 0 | | 2 |
| *Num LwSensorData | 0 | 8 | 0 | | 2 |
| *Remote Auth min | 0 | 65535 | 0 | | 2 |
| *MaskOut Warning1 | 0 | 999 | 0 | | 2 |
| *MaskOut Warning2 | 0 | 999 | 0 | | 2 |
| * Fan Duty Idle % | 3 | 100 | 100 | | 2 |
| **33 BRAKE** | **Min** | **Max** | **Default** | **Actual** | **Access Level** |
| *BRK TRQ %Load1 | 120 | 300 | 150 | | 2 |
| *BRK TRQ %Load2 | 110 | %Load1 or 150 | 125 | | 2 |
| *In Car noLoad kg | 80 | 200 | 80 | | 2 |
| *Self BTI Block | 0 | 2 | 0 | | 2 |
| *Check Unbalance | 0 | 1 | 0 | | 2 |
| *Lockup by S-BTI | 0 | 1 | 0 | | 2 |
| *Brk DelayTime ms | 0 | 10000 | 1500 | | 2 |
| *BrkTrqOffset kgm | 0 | 200 | 0 | | 2 |
| *BRK TRQ Trim % | 50 | 150 | 100 | | 2 |
| *ZERO SPEED2 mm/s | 1 | 20 | 10 | | 2 |
| *RATE BRK TRQ kgm | 0 | 200 | 0 | | 2 |
| *BRK TRQ MODE | 0 | 1 | 0 | | 2 |
| *BCM present 0/1 | 0 | 1 | 1 | | 2 |
| *Int Brk Type 0-4 | 0 | 4 | 0 | | 2 |
| *Brk Sw Type 0-6 | 0 | 6 | 1 | | 2 |
| *Brk Pick Time ms | 0 | 10000 | 1500 | | 2 |

| | | | | | |
|---|---|---|---|---|---|
| *Brk Setl Time ms | 0 | 10000 | 500 | | 2 |
| *Lft Brk Delay ms | 0 | 10000 | 100 | | 2 |
| *Brk Lftd Dely ms | 0 | 10000 | 30 | | 2 |
| *Brk ramp up t ms | 1 | 5000 | 500 | | 2 |
| *Brk ramp dn t ms | 1 | 3000 | 500 | | 2 |
| *Brk hold Dely ms | 0 | 5000 | 200 | | 2 |
| *Brk Pick A | 1 | 15.0 | - | | 2 |
| *Brk Pick % | 10 | 100 | 85 | | 2 |
| *Brk Hold A | 1 | 15.0 | - | | 2 |
| *Brk Drop % | 1 | 50 | 30 | | 2 |
| *Brk Bus OVT % | 100 | 150 | 130 | | 2 |
| *Brk OCT A | 1 | 15.7 | 10.0 | | 2 |
| *Brk Bus UVT % | 0 | 100 | 70 | | 2 |
| *Brk Nom DC V | 40 | 350 | 310 | | 2 |
| *Brk dcv fscale V | 800 | 1200 | 1050 | | 2 |
| *Brk Crr fscale A | 14 | 50.0 | 15.7 | | 2 |
| *Brk R ohm | 1.0 | 50 | - | | 2 |
| *Brk L H | 0.1 | 50 | - | | 2 |
| *Brk I bw pick Hz | 0.1 | 50 | - | | 2 |
| *Brk I bw hold Hz | 0.1 | 50 | - | | 2 |
| *Brk War Det Cnt | 0 | 10 | 3 | | 2 |
| *Brk Pick V % | 0 | 100 | 70 | | 2 |
| *Brk Hold V % | 0 | 100 | 40 | | 2 |
| *Sequenced Brk0/1 | 0 | 1 | 0 | | 2 |
| *SBSB Vel mm/s | 0 | 3000 | 2500 | | 2 |
| *SBSB Motor Trq % | 29 | 125 | 125 | | 2 |
| *SBSB Regen Trq % | 0 | 79 | 0 | | 2 |
| **34 MACHINE** | **Min** | **Max** | **Default** | **Actual** | **Access Level** |
| *Mtr Shft Pwr kW | 0 | 400 | 20 | | 2 |
| *Rtd Mtr Spd RPM | 1 | 5000 | 1200 | | 2 |
| *Rtd Mtr Ln-Ln V | 100 | 600 | 380 | | 2 |
| *Rtd Mtr I Arms | 0 | 600 | 0 | | 2 |
| *Rtd Mtr Freq Hz | 5 | 60 | 40 | | 2 |
| *LR Ampl KP/Ki PU | 0 | 0.5 | 0.2 | | 2 |
| *LR Ampl RTC PU | 0 | 0.5 | 0.35 | | 2 |
| *Mtr Lsigma mH | 0.1 | 10 | 1 | | 2 |
| *Self Tune Config | 0 | 4 | 0 | | 2 |
| *Low Volt Op 0/1 | 0 | 1 | - | | 2 |
| *Geared StrJR 0/1 | 0 | 1 | 0 | | 2 |
| *Number of Poles | 2 | 100 | - | | 2 |
| *Rated Trq Nm | 0.1 | 20000 | - | | 2 |
| *Rated Trq I A | 0.1 | 1000 | - | | 2 |
| *Ld mH | 0.01 | 1000 | - | | 2 |
| *Lq mH | 0.01 | 1000 | - | | 2 |
| *R Ohm | 0 | 30 | - | | 2 |
| *T/A Slope % | 0 | 100 | - | | 2 |
| *T/A Offset A | 0 | 500 | - | | 2 |
| *Kt Slope 1/kNm | 0 | 15 | - | | 2 |
| *Id Saturation A | 0 | 1000 | - | | 2 |
| *Iq Saturation A | 0 | 1000 | - | | 2 |

| | | | | | |
|---|---|---|---|---|---|
| *Ld Slope mH/A | 0 | 30 | - | | 2 |
| *Lq Slope mH/A | 0 | 30 | - | | 2 |
| *Ld Slope uH/A | 0.0 | 30000 | - | | 2 |
| *Lq Slope uH/A | 0.0 | 30000 | - | | 2 |
| *Lq0 mH | 0.01 | 1000 | - | | 2 |
| *Lq1 1/mA | 0 | 400 | - | | 2 |
| *Lq2 1/mA^2 | 0 | 1000 | - | | 2 |
| *Ld0 mH | 0.01 | 1000 | - | | 2 |
| *Rated Mag I A | 0.1 | 1000 | - | | 2 |
| *Peak Mag I A | 0 | 1000 | - | | 2 |
| *Rtr TimeConst s | 0.001 | 10 | - | | 2 |
| *Max Flux time s | 0.1 | 5.0 | 1.0 | | 2 |
| *Rated Motor rpm | 1 | 5000 | - | | 2 |
| *Mag err thr eDeg | 0 | 40 | 20 | | 2 |
| * LRT AC Level PU | 0.01 | 0.5 | 0.06 | | 2 |
| *ARD LRT AC Lv PU | 0.01 | 0.5 | 0.06 | | 2 |
| *LRT DC Level PU | 0.1 | 0.5 | 0.1 | | 2 |
| *LRT mot err eDeg | 0 | 10 | 8 | | 2 |
| *Fld Wkn Lvl % | 0 | 200 | 100 | | 2 |
| *Fld Wkn BW Hz | 0 | 50 | 10 | | 2 |
| *Inv Hrmnc On 0/1 | 0 | 1 | 0 | | 2 |
| *Inv Hrmnc dS % | -1 | 1 | 0 | | 2 |
| *Inv Hrmnc dC % | -1 | 1 | 0 | | 2 |
| *Inv Hrmnc qS % | -1 | 1 | 0 | | 2 |
| *Inv Hrmnc qC % | -1 | 1 | 0 | | 2 |
| **35 PROFILE** | **Min** | **Max** | **Default** | **Actual** | **Access Level** |
| *Man Speed mm/s | 10 | 750 | 250 | | 2 |
| *Man Acc mm/s2 | 100 | 1200 | 350 | | 2 |
| *Man Dec mm/s2 | 100 | 1200 | 750 | | 2 |
| *Insp Speed mm/s | 10 | 630 | - | | 2 |
| *Nom Speed mm/s | 0 | 16000 | - | | 2 |
| *Accel mm/s2 | 25 | 1200 | - | | 2 |
| *Decel mm/s2 | 25 | 1200 | - | | 2 |
| *Min Tdecel mm/s2 | 300 | 1500 | 500 | | 2 |
| *Jerk mm/s3 | 100 | 2400 | - | | 2 |
| *Numb AltProfiles | 0 | 3 | 0 | | 2 |
| *Alt1 Speed mm/s | 0 | 16000 | - | | 2 |
| *Alt1 AcDec mm/s2 | 25 | 1200 | - | | 2 |
| *Alt1 Jerk mm/s3 | 100 | 2400 | - | | 2 |
| *Alt2 Speed mm/s | 0 | 16000 | - | | 2 |
| *Alt2 AcDec mm/s2 | 25 | 1200 | - | | 2 |
| *Alt2 Jerk mm/s3 | 100 | 2400 | - | | 2 |
| *Alt3 Speed mm/s | 0 | 16000 | - | | 2 |
| *Alt3 AcDec mm/s2 | 25 | 1200 | - | | 2 |
| *Alt3 Jerk mm/s3 | 100 | 2400 | - | | 2 |
| *Corr Speed mm/s | 0 | 2000 | - | | 2 |
| *Base Speed % | 50 | 100 | 75 | | 2 |
| *Creep Speed mm/s | 0 | 100 | 0 | | 2 |
| *Creep Length mm | 0 | 100 | 0 | | 2 |
| *Creep Jerk 0/1 | 0 | 1 | 1 | | 2 |
| *Zero Vel Tim ms | 0 | 2000 | 500 | | 2 |

| | | | | | |
|---|---|---|---|---|---|
| *MCSS Overspeed % | 0 | 200 | 200 | | 2 |
| *MAN Overspeed % | 0 | 200 | 125 | | 2 |
| *ARO Overspeed % | 0 | 160 | 150 | | 2 |
| *ARO Speed mm/s | 50 | 350 | 100 | | 2 |
| *ETP Spe %DutySpe | 10 | 100 | 80 | | 2 |
| *ETP2 Spe %Duty | 10 | 100 | 80 | | 2 |
| *ETP delta % | 1 | 20 | 5 | | 2 |
| *Buffer/ETSD mm/s | 0 | 16000 | 1000 | | 2 |
| *GovOverSpd mm/s | 0 | 16000 | 0 | | 2 |
| *Man Load % | 0 | 125 | 50 | | 2 |
| *Enc acc lim m/s2 | 0 | 1000 | 0 | | 2 |
| *Enc acc lim t ms | 0 | 1000 | 0 | | 2 |
| *UCM Acc Up mm/s2 | 100 | 4000 | 1200 | | 2 |
| *UCM Acc Do mm/s2 | 100 | 4000 | 1200 | | 2 |
| *Dec Speed mm/s | 0 | 16000 | Blank | | 2 |
| *TerminalPhase mm | 0 | 25000 | 0 | | 2 |
| *TerminalPhs mm/s | 10 | 8000 | 300 | | 2 |
| **36 FACTORY** | **Min** | **Max** | **Default** | **Actual** | **Access Level** |
| Factory Password | 0 | 32000 | 0 | | 2 |
| *DC Bus fscale V | 800 | 1200 | 1000 | | 2 |
| *AC Line fscale V | 800 | 1200 | 1000 | | 2 |
| *Ac/Dc Calibra PU | 0 | 1.5 | 0 | | 2 |
| *Cnv PWM freq Hz | 2000 | 10000 | 10000 | | 2 |
| *Inv PWM freq Hz | 2000 | 10000 | 10000 | | 2 |
| *Cnv Hrmnc On 0/1 | 0 | 1 | 1 | | 2 |
| **61 ENG ADJUST** | **Min** | **Max** | **Default** | **Actual** | **Access Level** |
| Engineer Passwrd | 0 | 32000 | 0 | | 2 |
| *PFC Volt Lvl % | 0 | 200 | 100 | | 2 |
| *Min IGBT on t us | 0 | 5 | 1.5 | | 2 |
| *Pos Gain | 1 | 4 | 2.5 | | 2 |
| *Pos Err Lim mm | 0 | 1000 | 254 | | 2 |
| *Vel fscale PU | 5 | 500 | 100 | | 2 |
| *LRT Frequency PU | 0.1 | 1.0 | 0.9 | | 2 |
| *LRT Ld Cycles | 1 | 10 | 3 | | 2 |
| *Vq out thresh PU | 0.0 | 1.0 | 0.5 | | 2 |
| *Sngl PWM ang deg | 0 | 90 | 20 | | 2 |
| *Test Noise Lvl % | 1 | 1000 | 100 | | 2 |
| *Test Noise BW Hz | 0.01 | 2500 | 1000 | | 2 |
| *Target mm | 0 | 99999 | 10000 | | 2 |
| *Drive Pmax kW | 0 | 1000 | 1000 | | 2 |
| *Load in car % | 0 | 100 | 0 | | 2 |
| *Drive Vrated m/s | 0 | 15 | 0 | | 2 |
| *Belt Cmp Off A | 0 | 10 | 0 | | 2 |
| *Belt CmpSlp mA/m | 0 | 2000 | 0 | | 2 |
| *BeltCmp Lrn? 0/1 | 0 | 2 | 1 | | 2 |
| *2D Enable? 0/1 | 0 | 1 | 0 | | 2 |
| *ARO Bus LwrLim V | 150 | 800 | 500 | | 2 |
| *ARO Mot Id PU | 0 | 10 | 2 | | 2 |
| *Max Bat Chrg I A | 0 | 20 | 0 | | 2 |
| *Brk I Hold A | 0 | 20 | 0.5 | | 2 |

| | | | | | |
|---|---|---|---|---|---|
| *Brk I Max A | 0 | 20 | 10 | | 2 |
| *Brk I Offset A | 1.1 | 20 | 2 | | 2 |
| *SVT Timeout min | 0 | 999 | 240 | | 2 |
| *Pre Chg Lim sec | 0.1 | 10.0 | 10.0 | | 2 |
| *Rollback Call mm | 0 | 50 | 20 | | 2 |
| * Inv ReLe Ilimit% | 0 | 100.0 | 100.0 | | 2 |
| *Vel Inr wc rad/s | 0.1 | 10 | 2 | | 2 |
| *Torq Obs Err % | 0 | 100 | 0 | | 2 |
| **62 ENG TEST** | **Min** | **Max** | **Default** | Actual | **Access Level** |
| Engineer Passwrd | 0 | 32000 | 0 | | 3 |
| *Engineering Test | 0 | 10000 | 0 | | 3 |
| *EngTest Param1 | 0 | 99999 | 0 | | 3 |
| *EngTest Param2 | 0 | 99999 | 0 | | 3 |
| *EngTest Param3 | 0 | 99999 | 0 | | 3 |
| *EngTest Param4 | 0 | 99999 | 0 | | 3 |
| *EngTest Param5 | 0 | 99999 | 0 | | 3 |
| *EngTest Param F1 | 0 | 99999 | 0 | | 3 |
| *EngTest Param F2 | 0 | 99999 | 0 | | 3 |
| *EngTest Param F3 | 0 | 99999 | 0 | | 3 |
| *EngTest Param F4 | 0 | 99999 | 0 | | 3 |
| *EngTest Param F5 | 0 | 99999 | 0 | | 3 |
| *Cnv PWM Avg 0/1 | 0 | 1 | 0 | | 3 |
| *Inv HrmncCmp Deg | 0 | 180 | 0 | | 3 |
| *Inv Hrmnc BW Hz | 0 | 1800 | 500 | | 3 |
| *Inv Hr Thrs mm/s | 0 | 99999 | 0 | | 3 |
| *TimeDec Test 0/1 | 0 | 1 | 0 | | 3 |
| *Encoder Test 0/1 | 0 | 1 | 0 | | 3 |
| *Ovrtmp Estop 0/1 | 0 | 1 | 0 | | 3 |
| *HS Overtmp deg C | 0 | 200 | 85 | | 3 |
| *Flr To Test | 0 | 1000 | 0 | | 3 |
| *Flr Pos mm | 0 | 99999 | 0 | | 3 |
| *Flr New Pos mm | 0 | 99999 | 0 | | 3 |
| *Flr Vane Len mm | 0 | 99999 | 0 | | 3 |
| *ALWA Confg 0/1/2 | 0 | 2 | 0 | | 3 |
| *ARO FLAG AR-Rly | 0 | 3 | 0 | | 3 |
| *ARO FLAG BLV-Rly | 0 | 3 | 0 | | 3 |
| *ARO Faults | 0 | 8 | 0 | | 3 |
| *ARO Alarm | 0 | 1 | 0 | | 3 |
| *UCM-EN BlkLatchd | 0 | 3 | 0 | | 3 |
| *DDP Fault | 0 | 1 | 0 | | 3 |
| *FAN off/0 on/1 | 0 | 1 | 1 | | 3 |
| *Fan Random Area | 0 | 10 | 0 | | 3 |
| *Temp Over Test | 0 | 100 | 0 | | 3 |
| *Can Enc umm/cnt | 1 | 99999 | 1 | | 3 |
| *SSM Config | 0 | 0xFFFFFFFF | - | | 3 |
| *SSM PhantRPeriod | 0 | 0xFFFFFFFF | - | | 3 |
| *SSM MaxSlip | 0 | 0xFFFFFFFF | - | | 3 |
| *SSM MaxSlip2 | 0 | 0xFFFFFFF | - | | 3 |

| | | | | | |
|---|---|---|---|---|---|
| | | F | | | |
| *SSM MaxSlip3 | 0 | 0xFFFFFFFF | - | | 3 |
| *VTE LdRatio Hyst | 0 | 0xFFFFFFFF | - | | 3 |
| *VTE Hitch Strtch | 0 | 0xFFFFFFFF | - | | 3 |
| *VTE MaxErrSameEg | 0 | 0xFFFFFFFF | - | | 3 |
| *VTE MaxErrOtherE | 0 | 0xFFFFFFFF | - | | 3 |
| *VTE MaxDevFrmNom | 0 | 0xFFFFFFFF | - | | 3 |
| **63 DAC** | **Min** | **Max** | **Default** | **Actual** | **Access Level** |
| Engineer Passwrd | 0 | 32000 | 0 | | 3 |
| *DAC 1 Signal | 0 | Note 1 | 1 | | 3 |
| *DAC 2 Signal | 0 | Note 1 | 2 | | 3 |
| *DAC 3 Signal | 0 | Note 1 | 3 | | 3 |
| *DAC 4 Signal | 0 | Note 1 | 4 | | 3 |
| *DAC 5 Signal | 0 | Note 1 | 5 | | 3 |
| *DAC 6 Signal | 0 | Note 1 | 6 | | 3 |
| *DAC 1 Gain | 0 | 15 | 7 | | 3 |
| *DAC 2 Gain | 0 | 15 | 7 | | 3 |
| *DAC 3 Gain | 0 | 15 | 7 | | 3 |
| *DAC 4 Gain | 0 | 15 | 7 | | 3 |
| *DAC 5 Gain | 0 | 15 | 7 | | 3 |
| *DAC 6 Gain | 0 | 15 | 7 | | 3 |
| *LvlAccThresholds | 0 | 0xFFFFFFFF | -1 | | |
| **64 I2C EEPROM** | **Min** | **Max** | **Default** | **Actual** | **Access Level** |
| Factory Password | 0 | 32000 | 0 | | 2 |
| *I2CEE Val@2.0000 | 0 | 65535 | 0 | | 2 |
| *I2CEE Val@3.0000 | 0 | 65535 | 0 | | 2 |
| *I2CEE Val@4.0000 | 0 | 65535 | 0 | | 2 |

Note 1: Define as the number of signals in the DAT (30959) and the GDCB Code

## 6.7 Detailed Parameter Description

This section contains the detail descriptions for each of the service tool parameters.

### 6.7.1 3-1 CONTRACT

| SVT Display | Description |
|---|---|
| `Interface Type` | Specifies the control system and interface being used:<br>0 – RS422 Interface, MCSS or GCS, profile generator in controller<br>1 – CAN Interface, TCBC or GCS, profile generator in drive<br>2 – RS422-JIS interface, GCS, profile generator in controller<br>3 – RS422-JIS-R interface, GCS, profile generator in controller<br>4 – CAN interface, GCS, profile generator in controller<br>See the table below for more detailed dependencies. |

| Interface Type | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| RS422 Interface | X | | | | |
| RS422-JIS Interface | | | X | | |
| RS422-JIS-R Interface | | | | X | |
| CAN Interface | | X | | | X |
| Profile Generator and Position Control in Drive | | X | | | |
| Profile Generator and Position Control in Controller | X | | X | X | X |
| Compatible with GCS-EN | | X | | | |
| Compatible with GCS-JIS | | | X | X | |
| Compatible with GCS-NSAA | X | | | X | |
| Compatible with MCSS | X | | | | |
| Compatible with TCBC | | X | | | |
| Optimized ARO | | | | X | |
| EN-ARO | | X | | | |
| EN-MRO | | X | | | |
| JIS Feature – Software Reset (Remote Rescue) | | X | X | X | |
| JIS Feature – Battery Mode (ARO) | | | X | X | |
| JIS Feature – Automatic recovery at Earthquake | | X | X | X | X |
| JIS Feature – Overcurrent detection | | X | X | X | |
| JIS Feature – Drive error code (remote Inspection) | | X | X | X | |
| JIS Feature – Brake switch detection | | X | | X | |
| JIS Feature – DBR-JIS | | X | | X | |
| JIS Feature – UCMP-JIS(E2) | | | | | X |
| Central Failure Management CFM | | X | | | |
| TCI Limit | | X | | | |
| Smart DBR | | X | | | |
| Self-BTI | | X | | | |

| | |
|---|---|
| JIS Function | Specifies if all the following JIS features are enabled or disabled:<br>0 – Disabled<br>1 – Enabled<br>JIS Feature – Software Reset (Remote Rescue)<br>JIS Feature – Battery Mode (ARO)<br>JIS Feature – Drive error code (remote Inspection)<br>JIS Feature – UCMP-JIS for LCRD and HSOVF<br><br>2- Enabled<br>JIS Feature – UCMP-JIS(E2) for “Interface Type = 4 – Over CAN”<br>JIS Feature – UCMP-JIS(MCS416) for “Interface Type = 3 – RS422”<br><br>1 or 2 – Enabled<br>JIS Feature – Start/Stop Shock Detect<br>JIS Feature – Overcurrent detection<br>JIS Feature – Automatic recovery at Earthquake<br>JIS Feature – Brake switch detection (for UCMP)<br>JIS Feature – Power-loss fault management<br>JIS Feature – Encoder fault management<br>JIS Feature – Magnet position monitoring under constant speed<br>JIS Feature – Velocity control during Re-leveling<br>JIS Feature – Brake open test mode |
| Duty Type | **Visible only for “JIS Function 0/1” = 1 or HSOVF drives.**<br>Specifies the duty No. of elevator system<br>A – No specification of the duty (Default)<br>1000~1999 – For Gen2 P&B system type |
| Drive Type | **Visible only if drive has no eI2C EEPROM storage capabilities (no drive type auto-detection) and Duty Type = 1.**<br>Specifies the drive being used:<br>15 – 15A Regenerative Drive, version 2<br>20 – 20A Regenerative Drive, version 2<br>25 – 25A Regenerative Drive<br>30 – 30A Regenerative Drive, version 2<br>40 – 40A Regenerative Drive<br>41 – 40A Regenerative Drive, version 2<br>60 – 60A Regenerative Drive<br>90 – 90A Regenerative Drive<br>120 – 120A Regenerative Drive<br>234 – 340A Regenerative Drive (200V type)<br>416 – 160A Regenerative Drive<br>428 – 280A Regenerative Drive<br>460 – 600A Regenerative Drive |
| ARO Type | Specifies the type of Automatic Rescue Operation (ARO) being used:<br>1 – NSAA/JIS: None (no ARO hardware connected to drive)<br>EN: ARPB-based ARO capable – ARO initiated via CAN if ARPB-based hardware connected<br>2 – JIS Interruptible Automatic Rescue Operation for JIS (ARO)<br>3 – JIS Non-interruptible Automatic Rescue Operation for JIS (NIARO)<br>4 – NSAA/EN Optimized Automatic Rescue Operation (OARO)<br>5 – JIS Interruptible Automatic Rescue Operation for 428G Drive (HSOVF_ARO) |

| | |
|---|---|
| ARO Release? 1/2 | **Visible only with ARO Type = 4 and "Interface Type" = 3.**<br>This parameter specifies if ARU1 hardware (48Vdc) or ARU2 hardware (96Vdc) is present. The default value is 1, where the ARU hardware is expected to be 48V battery voltage based architecture. In ARU1, ARO is executed only in the direction of gravity. If ARU R2 is used as the hardware, then this parameter needs to be set to 2. |
| ARD Operation | This parameter specifies which power source is connected to the drive during Automatic Rescue Operation:<br>0 = Battery (default value; used by legacy ARO)<br>1 = 3-phase AC (used by C-ARD with 380Vac three phase)<br>2 = Single-phase AC (used by C-ARD with 380Vac single phase)<br>ARD = Automatic Rescue Device<br>C-ARD = Commercial Automatic Rescue Device |
| ARO Delay Time s | **Visible only with ARO Type = 4 and "Interface Type" = 3.**<br>This is the delay time the drive determines it is time to start an ARO operation starting from the loss of the ac line voltage. The additional delay is introduced for reliable power loss detection.<br>The default value is 30. |
| ARO Time Max min | **Visible only with ARO Type = 4 and "Interface Type" = 3.**<br>This is the total time that the drive allows for a single ARO run. The main purpose is to save battery energy. At the end of this time the drive disconnects the battery from drive logic also, leaving the drive totally loss of power condition until the ac line comes back.<br>The default value is automatically set to 5 for ARU1 or 15 for ARU2. |
| Bat Peak Curr A | **Visible only with ARO Type = 4.**<br>This parameter sets the maximum battery current command (converter current limit) during an ARO run.<br>The software default is 45A, however, the installer must adjust the parameter as follows for ARU R1:<br>50 – for ARU R1.<br>45 – for ARU R2. |
| Motor Type | **Visible only for Duty Type = 1**<br>Specifies the motor being used. See **Section** 9 for a list of pre-defined motor types and their associated parameter values.<br><br>If the motor is not in the list, choose:<br>901 – Generic Induction motor<br>902 – Generic PM motor<br>The equivalent circuit parameters in section 3-4 MACHINE have to be entered for custom motors. |

| | |
|---|---|
| Duty Speed mm/s | **Visible only for Duty Type = 1**<br>Contract Duty Speed. For reference, mm/s = FPM x 5.08<br>This should be the contract speed (e.g. 1000 mm/s if the elevator is specified for 1m/s, even if the machine is rated for more). The rated RPM must be the corresponding rpm of the motor (not necessarily the motor's nominal speed). The elevator's nominal speed "Nom Speed mm/s" in the profile menu is linked to the "Duty speed" such: It determines the maximum speed that is reached during the profile of a NORMAL run. It may be smaller than the duty speed. It should not be set considerably higher than the duty speed because then it would trigger the overspeed detection.<br>**Warning**: ***For CAN-based controllers, set the elevator to ERO before changing this parameter***. Otherwise, the car may start a correction run using the wrong speed and result in tripping the governor. Ensure the three parameters: Encoder PPR, Duty Speed mm/s, and Rated rpm are set consistent with each other before placing the car on normal operation. |
| Rated rpm | **Visible only for Duty Type = 1**<br>Required motor RPM to reach contract speed. Describes a fixed relation to contract duty speed (in mm/sec) considering roping, gear ratio, and sheave diameter (in mm):<br>RPM = speed x Gear Ratio x Roping x 19.1 / Sheave Diameter<br>**Warning**: ***For CAN-based controllers, set the elevator to ERO before changing this parameter***. Otherwise, the car may start a correction run using the wrong speed and result in tripping the governor. Ensure the three parameters: Encoder PPR, Duty Speed mm/s, and Rated rpm are set consistent with each other before placing the car on normal operation. |
| Inertia kg-m2 | Total system inertia with balanced car. The value should be set according to contract data.<br><br>One way to estimate the inertia is to use the following formula:<br>J = 2 + 6 * DUTY_LOAD * (SHV_RADIUS^2)<br>Other ways to estimate inertia are given in Sections 9.1 and 9.2.<br><br>Note: the inertia value is automatically adjusted in the software as a function of car load. The adjusted value can be viewed in the service tool Inert used kg-m2. |
| Encoder Type 0/1 | **Visible only for Duty Type = 1**<br>Specifies the type of encoder:<br>0 – Incremental encoder<br>1 – Sinusoidal encoder<br>When using incremental encoder, there is a signal integrity check which can result in the fault 524 No Enc Signl. The check is only performed if the encoder termination is double-ended (see Enc termintn 1/2).<br><br>When using sinusoidal encoder, there is also a signal integrity check that results in the fault 541 SinCos Warng. |

| | |
|---|---|
| Enc termintn 1/2 | **Visible only for Duty Type = 1**<br>This parameter stands for the type of ending of the encoder.<br>1 – single ended termination<br>2 – double ended termination |
| Encoder PPR | **Visible only for Duty Type = 1**<br>Specifies the number of pulses per revolution (PPR) of the encoder.<br>**Warning**: ***For CAN-based controllers, set the elevator to ERO before changing this parameter***. Otherwise, the car may start a correction run using the wrong speed and result in tripping the governor. Ensure the three parameters: Encoder PPR, Duty Speed mm/s, and Rated rpm are set consistent with each other before placing the car on normal operation. |
| Duty Load kg | **Visible only for Duty Type = 1**<br>Contract Duty Load. This parameter is used only to calculate pretorque. Pretorque, as a force applied at the car, is commanded as a percentage of the rated full load of the car. For reference, kg = lbs / 2.2 |
| AC Main Vrms | **Visible only for Regen Drives**<br>Nominal AC line voltage (max 480 Vrms). This is used to determine under-voltage and over-voltage conditions as well as control gains for the converter. If the voltage entered is in the range [380, 415], then it is assumed the nominal voltage is the average of the range, 397.5 Vrms.<br>See also 302 VAC Over and 303 VAC Under. |
| Load Weigh Type | **Visible only when "Interface Type" = 1**<br>Specifies loadweighing device:<br>0 – None<br>1 – LWB2 via CAN<br>2 – Hitch LW via CAN<br>3 – Discrete LW via CAN |
| Load Wgh Lvl 1 %<br>Load Wgh Lvl 2 %<br>Load Wgh Lvl 3 %<br>Load Wgh Lvl 4 %<br>Load Wgh Lvl 5 % | **Visible only when Load Weigh Type = 3**<br>For discrete load weighing the percentage of load in car when the first switch goes off and,<br>the percentage of load in car when the second switch goes off and,<br>the percentage of load in car when the third switch goes off and,<br>the percentage of load in car when the fourth switch goes off and,<br>the percentage of load in car when the overlaod switch goes off. |
| Balance % | **Visible only when "Interface Type" = 1 or HSOVF or "Brake Tprque test mode"**<br>Nominal counterweight balance setting in percent. |
| Roping 1..4 | **Visible only when Interface Type = 1 or "JIS Function 0/1" = 1 or HSOVF drives.**<br>The value is used at hitch load weighing calibration during the learn run and by the brake torque test. |

| | |
|---|---|
| Vane Sensor Type | **Visible only when "Interface Type" = 1**<br>Specifies vane sensor configuration, see also 4.8 PRS:<br>0 – PRS2 with ADO/RLEV, 4Sensors, 250mm, N.O.<br>1 – PRS2 w/o ADO/RLEV , 3Sensors, 250mm, N.O.<br>2 – PRS2, 1Sensor, 250mm, N.O.<br>3 – RPD-P2, 1Sensor, 250mm, N.C.<br>4 – CEDES Photo, 1Sensor, 150mm, N.O.<br>5 – CEDES Photo, 4Sensor, 250mm, N.O.<br>6 – RPD-P3, 4Sensors, 250mm, N.O.<br>7 – PRS5, 1Sensor, 170mm, N.O.<br>8 – PRSxx, 1Sensor, 130mm, N.O.<br>9 – PRS2 1+2LV, 2Sensors, 250mm, N.O.<br>10 – RPD-P7A, 4Sensors, 150mm, N.O.<br>11 – RPD-P8A, 4Sensors, 180mm, N.O.<br>12 - PRS8N, 4 Sensors, 170mm, N. O.<br>15 - PRS8N, 1 Sensor, 170mm, N.O.<br>99 – Custom PRS, configure in 6.7.2 3-2 ADJUSTMENT, "Vane Length mm" ..."DIS NO=0 / NC=1" |
| PRS via CAN 0/1 | **Visible only when "Interface Type" = 1**<br>Specifies if PRS signals are connected directly to drive or read via CAN:<br>0 – PRS signals wired directly to the drive<br>1 – PRS signals received via CAN bus |
| DDP sec | **Visible only when "Interface Type" = 1**<br>Specifies the time for Delayed Drive Protection. Has to be increased according to contract speed and floor distance if required.<br>Note that if an alternate speed profile is used (Alt1 … Alt3 Speed) which is slower than the nominal speed profile then the value of this parameter will be proportionally increased internally. In any case the upper limit is 45 sec.<br>See fault: 517 DDP Error |
| ARD DDP sec | **Visible only when "Interface Type" = 1**<br>Specifies the time for Delayed Drive Protection **during ARD**. Has to be increased according to contract speed and floor distance if required.<br>Note that if an alternate speed profile is used (Alt1 ... Alt3 Speed) which is slower than the ARD speed profile then the value of this parameter will be proportionally increased internally. In any case the upper limit is 600 sec and default 270.<br>See fault: 517 DDP Error |
| Number of DZ | **Visible only when "Interface Type" = 1**<br>Total number of door zones.<br>Note: Value may be changed by the system's auto-installation routines. |
| Bottom DZ | **Visible only when "Interface Type" = 1**<br>Bottom door zone number. Must match TCBC parameter "BOTTOM". Should be zero except for units within a group with different bottom door zone numbers.<br>Note: Value may be changed by the system's auto-installation routines. |
| DZ in 1LS | **Visible only when "Interface Type" = 1**<br>Number of door zones in 1LS.<br>Note: Value may be changed by the system's auto-installation routines. |
| DZ in 2LS | **Visible only when "Interface Type" = 1 and "412RCR,HSOVF drive" and "JIS Option Mode = 80" and "Landing Table = Invalid"**<br>Number of door zones in 2LS.<br>This is valid for TCI mode with "Invalid Floor" during construction mode. |

| | |
|---|---|
| LS Pos Recov 0/1 | **Visible only when "Interface Type" = 1**<br>Setting this parameter to '1' will allow the drive to recover position during rescue run within LS if there is only one door zone in LS.<br>0 – Prohibit position recovery in LS during rescue run<br>1 – Allow position recovery in LS during rescue run<br>Default setting is '0'. |
| ARO Bus Nom DC V | **Visible only for Duty Type = 1 and ARO Type = 2 or 5.**<br>This parameter is used for "DC Bus Under fault" during ARO operation. The default is set to "180V". |
| 6LS-TYP 0/1 | **Visible only when "Interface Type" = 1 and not drive OVFR02A-412 detected**<br>Type of 6LS sensor.<br>0 = standard hardware sensor present<br>1 = no hardware 6LS present; 2LS evaluated instead (by GECB).<br>Note: This parameter is mainly used as a "safety" backup for a GECB parameter which has the same name. Both parameters must be set to the same value. |
| 6LS-TYP 0-2 | **Visible only when "Interface Type" = 1 and drive OVFR02A-412 detected**<br>0,1 = see above<br>For LVA – GeN2 Premier at 3 & 3.5 m/s the drive is installed in the hoistway.<br>2 = TCI run up possible above TOP unitl mechanical 6LS.<br>Note: The according GECB parameter has to be set to 0. |
| DBR Mode 0-3 | **Visible only when Interface Type = 1**<br>To avoid energy recovering an external Smart DBR unit can be used. It must be connected to the DC link.<br>A - standard regen operation as usual, no Smart DBR required.<br>1 - no energy recovering:<br>In case of negative converter current the converter is disabled and the control of the DC link voltage has to be performed by the external Smart DBR unit.<br>2 - switchable DBR mode via discrete input P 6.6:<br>0V: standard regen operation<br>24V: no energy recovering<br>3 - same as 2 but discrete input logic reversed. |
| UCM-EN on/off | **Visible only when "Interface Type" = 1**<br>Activate or deactivate UCM (Unintended Car Motion) Monitoring feature as designed for EN81 controller.<br>0 = UCM-EN monitoring off (but UCM-EN brake monitoring still active)<br>1 = UCM-EN monitoring on<br>Note: When using this feature, the corresponding feature in the GECB must be enabled (UCM_TYP=3), too, otherwise the drive will not run!!! |
| TwoStepSpeed 0/1 | **Visible only when "Interface Type" = 1**<br>This feature is used in Korea for modernization market. It allows the speed of the modernized elevator to be increased using the same buffer, top clearance and pit depth. Setting this parameter to 1 enables the two speed operation feature:<br>0 : Normal operation<br>1: Set the two step speed profile operation<br>The requirements for the buffer, top clearance and pit depth are achieved by lowering the speed when approaching the terminal zones. The speed reduction is triggered by additional door zone sensors near the top and bottom. The sensors are installed in addition to the normal door zone sensors. The location of the door zone sensors is indicated by the following two parameters "DZ below 1DS" and "DZ above 2DS". The speeds are determined by the parameters:<br>"Nom Speed mm/s" and "Dec Speed mm/s".<br>DS status can be monitored with "DS DS1 DS2 FLR".<br>For sensor failure, see the event "410 Low Speed". |

| | |
|---|---|
| DZ below 1DS | **Visibile only when "TwoStepSpeed 0/1" = 1**<br>Bottom side sensor position of two step speed profile operation.<br>Example: If bottom floor = 1F and sensor position =4F,<br>"DZ below 1DS" = 3 (4F – 1F) |
| DZ above 2DS | **Visibile only when "TwoStepSpeed 0/1" = 1**<br>Top side sensor position of two step speed profile operation.<br>Example: If top floor = 10F and sensor position =8F,<br>"DZ above 2DS" = 2 (10F – 8F) |
| SFC InWiring 0/1 | **Visible only when "Interface Type" = 1**<br>Specifies Safety Chain input configuration.<br>0- Safety Chain input via separate UIB & DIB<br>1- Safety Chain input with UIB & DIB tied together for all operation modes.<br>Note: a setting of 1 is necessary when only one common safety-chain signal is available instead of separate UIB & DIB signals. This signal must then be connected to both UIB and DIB inputs. |
| ERO Type 0/1 | **Applicable only when "Interface Type" = 1.**<br>The user can choose how ERO runs behave at the terminal landing. The parameter has the following options:<br>0 = without limit<br>1= car stops at terminal landings (same as TCI-limit) |
| TCI Pos Limit | **Applicable only when "Interface Type" = 1.**<br>This parameter determines the position where the TCI runs is ended in the terminal floors.<br><br>0 = stopping position of TCI at the terminal door zone is when the UIS signal becomes high at the top floor, and when the DIS signal becomes high at the bottom floor. Then at the top floor TCI stop, the Car will stop about 70mm under the landing zone.<br><br>1 = stopping position of TCI at the terminal door zone is when the door zone s at the terminal landing. Then at the top floor, the car can stop 25mm higher than the landing zone.<br><br>Note: From the Korea government inspector's requirement, the stopping position of the TCI should be passed the door zone. Therefore option 1 is required to meet the requirement of the Korea government inspector. |

## 6.7.2 3-2 ADJUSTMENT

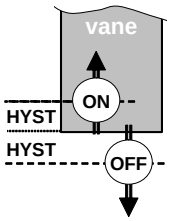
| SVT Display | Description |
|---|---|
| JIS Option Mode | **Visible only for "JIS Function 0/1" = 1 or HSOVF drives.**<br>0 – Normal (Default)<br>1 – For motor running with safety device locked. (Gen2 P&B)<br>If this is set to 1, the following setup is automatically used.<br>Track Error mm/s = 400 and No enc flt t sec =2.0.<br>2 – TRACKING_200 (Sets Track Error mm/s = 200)<br>3 – TRACKING_300 (Sets Track Error mm/s = 300)<br>11 – EAR_SETUP (see related parameters to EQAR )<br>60 – WITHOUT_UCMP (without UCMP module or for any fault mode of UCMP)<br>99 – EAR_TEST (for EQAR test)<br>100 – FAN_NORMAL (Sets "Fan Random Area" to "0" for Gen2PB)<br>101-106 – Duty Parameter set for GeN2 Comfort or Life |

| | |
|---|---|
| StartShock LVL2% | **Visible only for JIS Option Mode= 11 or 99**<br>This parameter is used for "start shock" detection in EQAR.<br>"Shock flag" becomes "TRUE" with the following condition between the run start and "Vel fbk = DET SP MAX mm/s".<br><br>"Absolute Inv Iq Diff [A]" > "Shock Threshold [A]" where:<br>"Absolute Inv Iq Diff [A]" = "Inv Iq Ref_max" – "Inv Iq Ref_min"<br>"Inv Iq Ref_max": Max of "Inv Iq Ref" during the term for Start Shock.<br>"Inv Iq Ref_min": Min of "Inv Iq Ref" during the term for Start Shock.<br>"Shock Threshold [A]" = "Rated Trq I A" x "Start Shock LVL2%" |
| Run Shock LVL% | **Visible only for JIS Option Mode = 11 or 99**<br>This parameter is used for "run shock" detection in EQAR.<br>"Shock flag" becomes "TRUE" with the following condition during "mcssCommand.dictatedAcc = 0" and "Vel fbk > DET SP MAX mm/s".<br><br>"Absolute Inv Iq Diff [A]" > "Shock Threshold [A]" where:<br>"Absolute Inv Iq Diff [A]" = "Inv Iq Ref_max" – "Inv Iq Ref_min"<br>"Inv Iq Ref_max": Max of "Inv Iq Ref" during the term for Start Shock.<br>"Inv Iq Ref_min": Min of "Inv Iq Ref" during the term for Start Shock.<br>"Shock Threshold [A]" = "Rated Trq I A" x "Run Shock LVL%" |
| EAR UP MtrI Arms | **Visible only for JIS Option Mode= 11 or 99**<br>This parameter is used for "run shock" detection in EQAR.<br>If UP run is done with EQAR, this setting threshold checks the "Inv Iq fbk". |
| EAR Inv Lmt Arms | **Visible only for JIS Option Mode= 11 or 99**<br>This parameter is used for "Drive Limit" detection in EQAR.<br>If the run is done with EQAR, this setting threshold checks the "Inv Iq fbk".<br>When the "Inv Iq fbk" exceeded this threshold, the Drive sends "DL" to MCSS. |
| EAR Overload sec | **Visible only for JIS Option Mode= 11 or 99**<br>This parameter specifies the maximum time the drive is allowed to operate at the rated *accelerating* current of the motor in EQAR. The rated accelerating current of the motor is assumed to be 167% of the *continuous* current rating of the motor which is specified by the parameter **EAR mtr OVL Arms**.<br><br>The maximum time allowed at other operating currents is prorated and can be calculated using the following formula:<br>$$t = \left( \frac{I_{accel}^2 - I_{cont}^2}{i^2 - I_{cont}^2} \right) t_{ovl}, i > I_{cont}$$<br>$$t = \infty, i \le I_{cont}$$<br>where<br>$I_{cont}$ = continuous current rating of the motor (Arms), specified by service tool parameter **EAR mtr OVL Arms**.<br>$I_{accel}$ = rated accelerating current of the motor (Arms), assumed to be 1.67 x $I_{cont}$<br>$t_{ovl}$ = allowed operating time, given by service tool parameter **EAR Overload sec**<br>i = actual drive current (Arms)<br>See fault: 109 Overload |
| EAR mtr OVL Arms | **Visible only for JIS Option Mode= 11 or 99**<br>Specifies the continuous rated current of the motor in EQAR. See above. |
| DBR ENE=1 DIS=0 | **Visible only for "JIS Function 0/1" = 1.**<br>This mode is set to 1, when using a generator to input AC power or having a DBR option.<br>This mode might generate "VdcOver" in Regen operation if there is not DBR unit. |

| | |
|---|---|
| Car Dir 0/1 | Specifies direction of the car:<br>0 – original<br>1 – reversed direction of profile and speed encoder<br>Must be toggled when car starts in other than expected direction. |
| Motor Phase 0/1 | **Visible only for Duty Type = 1**<br>Specifies orientation of motor phases relative to encoder direction:<br>0 – NEMA compliant motor phasing<br>1 – reversed direction of motor phasing<br>Must be toggled if motor phases are wired incorrectly. |
| Single Phase 0-3 | **Visible only for Duty Type = 1**<br>Specifies if a single-phase power supply is being used:<br>0 – normal 3-phase power supply<br>1 – single-phase power supply (fixed)<br>2 – 3-phase or single-phase; selectable at drive power-on<br>3 – Selected single-phase mode (only support for MCSS system)<br>Fixed single-phase power is intended for use only during construction. Selectable 3- or 1-phase mode can be used for rescue operation using a battery-powered single-phase power supply.<br>For MCSS system, the 3 phases or single phase is selected after automatic DSP reset when MCSS sends the phase mode change command. And then the parameter value is automatically set to 2 or 3. |
| AC SnglPh Main V | **Visible only when Single Phase 0-3 is set to 2 or 3.**<br>AC line voltage used when **Single Phase 0-3** is set to 2 and "Single-Phase mode" has been selected at drive power-on by the OCSS (via CAN-bus).<br>Note: Set automatically to value of ( **AC Main Vrms** / √3 ) when invisible. |
| Start Gain Ot PU | **Visible only for Duty Type = 1**<br>Used to increase the responsiveness of the velocity control when load weigh sensor is not valid or not installed. A value of 1.0 essentially disables it. It can be increased to typical of 4.0. The maximum acceptable might depend on the system because it causes vibration problems as it is increased. However, it can be used for discrete load weighing sensors to decrease roll back. |
| Start filt BW PU | **This parameter is visible only if Start Gain Ot PU is set larger than 1.**<br>Used to increase the responsiveness of the velocity control when load weigh sensor is not valid or not installed. A value of 1.0 essentially disables it. It can be increased to typical of 3.5. The maximum acceptable might depend on the system because it causes vibration problems as it is increased. However, it can be used for discrete load weighing sensors to decrease roll back. |
| Start Gain In PU | **This parameter is visible only if Start Gain Ot PU is set larger than 1.**<br>Used to increase the responsiveness of the velocity control when load weigh sensor is not valid or not installed. A value of 1.0 essentially disables it. It can be increased to typical of 4.0. The maximum acceptable might depend on the system because it causes vibration problems as it is increased. However, it can be used for discrete load weighing sensors to decrease roll back. |
| SG Period sec | **This parameter is visible only if Start Gain Ot PU is set larger than 1.**<br>Use to control the duration of high bandwidth velocity control startup for rollback reduction. This parameter is used in conjunction with Start Gain Ot PU. |
| SG Ramp Down sec | **This parameter is visible only if Start Gain Ot PU is set larger than 1.**<br>Use to control the duration of transition from high velocity bandwidth control to nominal for rollback reduction. |
| End Gn Vel mm/s | **This parameter is visible only if Start Gain Ot PU is not set to 1.**<br>This parameter specifies the speed below which the velocity gain approaches and becomes equal to the **Start Gain Ot** PU parameter setting at the end of a run. |

| | |
|---|---|
| Norm Vel Resp PU | This parameter specifies the normalized response (normalized time constant) of the PI regulator of the outer velocity loop **during normal runs**. The default value of this parameter is 1. This parameter is useful for adjusting the stopping performance of systems that have a relatively high friction to inertia ratio by setting this parameter to less than 1. |
| Rele Vel Resp PU | **Visible only for "JIS Function 0/1" = 1 or HSOVF drives.**<br>This parameter specifies the normalized response (normalized time constant) of the PI regulator of the outer velocity loop **during relevel runs**. The default value of this parameter is 1. This parameter is useful for adjusting the stopping performance of systems that have a relatively high friction to inertia ratio by setting this parameter to less than 1. |
| Pretorque Trim % | Used to adjust pre-torque values to prevent rollback. Normally, this should be set to 100%. |
| Pretorque Trim2% | **Visible only for "Geared StrJR 0/1" = 1**<br>Used to adjust the pretorque values during regenerative runs only. This is useful in applications that use a worm-gear to compensate for star-jerk caused by the worm-gear. See related parameter "Geared StrJR 0/1" |
| Pretorq Mod 0/1 | **Visible only for Duty Type = 1**<br>When set to 1, this parameter enables a special pre-torque function for systems that have a high hoistway mechanical friction component that is both load and direction dependent (i.e. Double Deck Systems). When enabled, this function helps prevent rollback or roll forward for these systems by modifying the pre-torque calculation to account for the mechanical friction (when pre-torque differs significantly from stop torque).<br><br>Before this function is enabled, it is required that the load adjustment of MCSS should be completed. Also, this parameter should be set to 0 during any and all loadweigh system adjustment.<br>A- disable.<br>1- enable. |
| Track Error mm/s | **Visible only when NOT GEN2 machine (See "Motor Type")**<br>In all operating modes, the velocity command is compared to the velocity feedback. If a deviation exists which exceeds this parameter, a fault is logged. Default value for Gen2 motors is 100 mm/sec. See fault: 502 Vel Tracking |
| No Enc VThrs PU | **Visible only when NOT GEN2 machine (See "Motor Type")**<br>This parameter specifies the threshold for the total motor voltage at which a no encoder fault is reported. If the fault 529 No enc fdbck is reported, the encoder feedback was below 1mm/s and the motor voltage was above this threshold. The typical value and the default for Gen2 motors is 0.2PU, which is about 90 volts line-line motor voltage. |
| No enc flt t sec | **Visible only when NOT GEN2 machine (See "Motor Type")**<br>This parameter specifies the time for which the encoder speed is below 1mm/s while a nonzero velocity reference is commanded to the drive. If this time is exceeded, the fault 530 No enc tmout is declared.<br>The following settings are recommended:<br>Geared: 0.6<br>Gearless: 0.4<br>The default value in the software is 0.4 seconds. |
| Vel Notch1 Hz<br>Vel Notch2 Hz | **Visible only for Duty Type = 1**<br>These parameters specify the center frequencies of two independent notch filters in the velocity loop used to attenuate a mechanical resonance outside the bandwidth of the velocity regulator. These notch filters can be disabled by setting these parameters to zero. The width of the notch is set by the parameter Notch Band Hz |

| | |
|---|---|
| Notch Band Hz | **Visible only for Duty Type = 1**<br>This parameter specifies the width of the notch for the two notch filters in the velocity loop. |
| VelRate div 0..3 | **Visible only when "Encoder Type 0/1" = 0**<br>Specfies the rate of the encoder read and velocity calculation task.<br>0 – 1kHz rate<br>1 – 500Hz rate<br>2 – 250Hz rate<br>3 – 125Hz rate |
| Cnv Custom 0/1 | **Visible only for Regen Drives**<br>Specifies the control parameters for the converter current regulators.<br>0 – The converter control parameters are set to default values. The following converter-specific SVT parameters are not visible.<br>1 – The converter control parameters are set according to SVT parameters. The following converter-specific parameters in the SVT become visible and must be set. |
| Cnv Notch Hz | **Visible only when "Cnv Custom 0/1= 1.**<br>Specifies the center frequency of a notch filter in the converter d & q current regulators. The width of the notch is 300 Hz and the depth of the notch is 10dB. The filter is used to attenuate any resonance that may occur on the AC mains in the frequency range 800 to 2300 Hz. |
| Cnv crf Depth | **Visible only when "Cnv Custom 0/1= 1.**<br>**Applicable only to HSOVF**<br>This is crfDepth for Converter Notch Filter in units of dB.<br>The other Drives use "crfDepth = 10". |
| Cnv crf Width | **Visible only when "Cnv Custom 0/1= 1.**<br>**Applicable only to HSOVF**<br>This is crfWidth for Converter Notch Filter in units of Hz.<br>The other Drives use "crfWidth = 300". |
| Cnv BW PU | **Visible only when "Cnv Custom 0/1= 1.**<br>This parameter adjusts the desired converter current regulator (displayed in the monitor menu BW(Hz):Cnv Inv) bandwidth. This parameter is usually 0.7 and should not be changed. This parameter becomes useful when the drive has to be used with a step up transformer and when it is necessary to use a notch filter Cnv Notch Hz for the converter. |
| Dc V BW Hz | **Visible only when "Cnv Custom 0/1= 1.**<br>This parameter adjusts the desired dc bus voltage regulator bandwidth and it is set to 50Hz. This parameter becomes useful when the dc capacitor value is incorrect or out of tolerance. |
| Cnv L mH | **Visible only when "Cnv Custom 0/1= 1.**<br>Unsaturated current regulator inductance |
| Cnv Saturation A | **Visible only when "Cnv Custom 0/1= 1.**<br>Current level when line reactor saturation starts. |
| Cnv L Slope uH/A | **Visible only when "Cnv Custom 0/1= 1.**<br>Line reactor inductance variation as a function of current. |
| Cnv R Ohm | **Visible only when "Cnv Custom 0/1= 1.**<br>Current regulator resistance that controls disturbance rejection. |
| Cnv TmpObsrv T s | **Visible only when "Cnv Custom 0/1= 1.**<br>Line Reactor temperature observer time constant. |
| Ploss Thr pre % | **Visible only when "Cnv Custom 0/1= 1.**<br>Specifies the power loss threshold as a percent of VA capability of the drive that is allowed during precharging. If the threshold is exceeded, the fault 208 Bus Cap Fail will be logged. |

| | |
|---|---|
| Ploss Thr idle % | **Visible only when "Cnv Custom 0/1= 1.**<br>Specifies the power loss threshold as a percent of VA capability of the drive that is allowed during idle. If the threshold is exceeded, the fault 208 Bus Cap Fail will be logged. |
| Ploss Thr run % | **Visible only when "Cnv Custom 0/1= 1.**<br>Specifies the power loss threshold as a percent of VA capability of the drive that is allowed during running (PWM active). If the threshold is exceeded, the fault 208 Bus Cap Fail will be logged. |
| Ploss Thrs Sng % | **Visible only when "Cnv Custom 0/1= 1.**<br>Specifies the power loss threshold as a percent of VA capability of the drive that is allowed during running (PWM active) and the drive is connected to a single phase power supply. If the threshold is exceeded, the fault 208 Bus Cap Fail will be logged. |
| PLL freq band Hz | **Visible only when "Cnv Custom 0/1" = 1.**<br>The phase-locked loop (PLL) in the software locks to the AC main frequency. Once locked, the PLL frequency is monitored to ensure that the frequency is within a tolerance band specified by this parameter (nominal frequency ± tolerance band). If the frequency falls outside of this band for an amount of time greater than specified by the parameter PLL freq time ms, then the fault response is ESTOP. This helps prevent the car from continuing to run in case the OCB or AC line main disconnect is switched off during low-speed regenerative runs (otherwise the car could continue to run from the regenerative energy from the drive). See fault 307 PLL Freq Rng. |
| PLL freq time ms | **Visible only when "Cnv Custom 0/1"= 1.**<br>If the PLL frequency falls outside of an allowed frequency band for a time greater than specified by this parameter, a PLL fault is triggered with ESTOP fault response. See fault 307 PLL Freq Rng. |
| Cnv Vmag Thrs PU | **Visible Only for Regen Drives**<br>This parameter sets the threshold for the 212 Cnv Vmag Flt fault.<br>The default value is 1.2. |
| Turnovr Delay ms | **Visible only when "Interface Type" = 0,2,3,4**<br>Specifies the amount of delay between fault detection and fault reaction during the turnover tests for the safeties. See Section 6.9.2 for more details. |
| VaneBias (10) mm | **Visible only when "Interface Type" = 1**<br>Offset in mm applied to all vane positions. Useful for adjusting the landing position after a learn run is performed. |
| Vane Hysteres mm | **Visible only when "Interface Type" = 1**<br>Hysteresis of PRS sensors, compensates overshoot in levelling.<br>Example: Running down into ldg x, the car stops 8mm lower than when running up => Hysteresis 4mm.<br>Note: Sensor hysteresis has same effect on levelling as regulator overshoot (see Pos fbk versus Pos ref in M-1-3). Ideally, regulator overshoot should be trimmed separately, e.g. by adjusting inertia.<br>  |
| Profile Delay ms | **Visible only when "Interface Type" = 1**<br>Specifies the amount of time that the profile will be delayed in Profile Mode and CAN Mode. |
| Relevel Delay ms | **Visible only when "Interface Type" = 1**<br>Used to suppress PRS signal glitches: A relevel run will only be started after the UIS/DIS signal has been off the vane for Relevel Delay ms. |
| Hover Enable 0/1 | **Visible only when "Interface Type" = 1**<br>Enables hovering feature, i.e. holding the car at a landing with brake open. |

| | |
|---|---|
| HoverRangeTopLdg | **Visible only when "Hover Enable 0/1"= 1**<br>Top landing of range (starting at bottom=0) where hovering shall be performed. |
| Hover Min Time s | **Visible only when "Hover Enable 0/1"= 1**<br>Minimum time to hover even in the absence of LW excitations. Time of potential Relevel runs is included. |
| Hover Fade Out s | **Visible only when "Hover Enable 0/1"= 1**<br>Time to hover after an LW excitation, includes time spent on actual Relevel runs. |
| Hover delta LW % | **Visible only when "Hover Enable 0/1"= 1**<br>Deviation of LW value from last latched value that shall establish an "LW excitation". When an excitation is detected, the current LW value is latched for detection of the next excitation. Units: % of duty load |
| Hover Gain PU | **Visible only when "Hover Enable 0/1"= 1**<br>This is the outer velocity gain during hovering. Increasing this value may minimize the amount of car deflection in response to a large load step in the car. However, the tradeoff is that the damping will decrease, making the car more susceptible to bounce and/or vibration. |
| AHC Enable 0/1 | **Visible only when "Interface Type" = 1**<br>Enables the advanced hovering control feature (AHC), i.e. holding the car at a landing with brake open and reacting quickly to load changes by using a top of car encoder/sensor. |
| TOC Car Dir 0/1 | **Visible only when "AHC Enable 0/1"= 1**<br>This parameter sets the direction convention for the top of car encoder. |
| AHC Kp gain | **Visible only when "AHC Enable 0/1"= 1**<br>This parameter sets the AHC position loop gain that minimizes the car position error. Typical value is 2. |
| AHC Kd gain | **Visible only when "AHC Enable 0/1"= 1**<br>This parameter sets the AHC position loop gain that minimizes the car position initial deflection when there is a load transfer. Typical values are 1 or 2. |
| AHC Kd RedFactor | **Visible only when "AHC Enable 0/1"= 1**<br>Enables the Kd gain scheduling feature for elevator systems where a single Kd value does not meet both the dynamic sag and damping requirements for all floors where Advanced Hovering Control (AHC) is active. This is the factor that reduces the AHC derivative gain Kd as a function of hoistway position. The higher the position, the lower the Kd value. A high Kd value is needed for near bottom floors to contain dynamic sag, and a lower Kd value is needed at higher floors to meet the damping requirements where AHC is still active. The parameter units are gain/0.1mm units. To defeat this feature, the default value of 0 should be used. |
| AHC Notch frq Hz | **Visible only when "AHC Enable 0/1"= 1**<br>This parameter sets the AHC position loop notch filter frequency. Typical value is about 1.8 Hz. |
| AHC Ln Enc Th mm | **Visible only when "AHC Enable 0/1"= 1**<br>This is the threshold for the "548 CarEncErr LR" warning fault management. This threshold is compared to the difference between the top of car encoder and the machine encoder for a Learn Run. A typical value is 200 mm. |
| AHC Nm Enc Th mm | **Visible only when "AHC Enable 0/1"= 1**<br>This is the threshold for the "547 CarEncErr NR" warning fault management. This threshold is compared to the difference between the top of car encoder and the machine encoder for a Normal Run. A typical value is 200 mm. |

| | |
|---|---|
| AHC Enc/Vn Th mm | **Visible only when "AHC Enable 0/1"= 1**<br>This is the threshold for the "549 AHC Enc/Vane" fault management. This threshold is compared to the amount of car motion as detected by the top of car encoder when the car leaves the "center vane" position. If the amount of car motion is less than or equal to this threshold when the car leaves the center vane position, then it is assumed that the top of car encoder is not properly tracking car motion, and this fault is declared. A typical value for this threshold is 0 mm. |
| Pos Stop Tol mm | **Visible only when "Interface Type" = 1**<br>Specifies the position stopping tolerance that is used to decide the car has reached the target.<br>See fault: 506 Stopping Err |
| Vel Stop mm/sec | **Visible only when "Interface Type" = 1**<br>Specifies the velocity stopping tolerance that is used to decide the car has reached the target.<br>See fault: 506 Stopping Err |
| Overload sec | This parameter is used to 134inimum134n the overload protection and specifies the maximum time the drive is allowed to operate at the rated motor accelerating current. The rated motor accelerating current is determined by the SVT parameters Rated mtr i Arms and Rated 134inim PU:<br><br>Iacc,rated = Rated mtr i Arms x Rated 134inim PU<br><br>where Rated mtr i Arms is the continuous rated current of the motor.<br><br>When the actual motor current is lower than the rated motor accelerating current, the allowable time increases. The drive is allowed to run indefinitely when the actual operating current is at or below the rated motor current. The exact time allowed at any operating current can be calculated using the following formula:<br>$t = \left( \frac{I_{accel}^2 - I_{cont}^2}{i^2 - I_{cont}^2} \right) t_{ovl}, i > I_{cont}$<br>$t = \infty, i \le I_{cont}$<br>where<br>$I_{accel}$ = rated motor accelerating current, determined by: Rated mtr i Arms x Rated 134inim PU<br>$I_{cont}$ = continuous current rating of the motor (Arms), specified by service tool parameter Rated mtr i Arms.<br>$T_{ovl}$ = maximum time allowed to operate at the rated motor accelerating current and specified by SVT parameter Overload sec<br>i = actual motor current (Arms)<br>See fault: 109 Overload |
| Rated mtr i Arms | **Visible only for Duty Type = 1**<br>This parameter is used to 134inimum134n the overload protection and specifies the continuous rated current of the motor in Arms. This is the rating at which the motor can operate indefinitely. |
| Rated 134inim PU | **Visible only for Duty Type = 1**<br>This parameter is used to 134inimum134n the overload protection and specifies the rated accelerating current of the motor in per-unit of the rated motor current parameter Rated mtr i Arms. For example, if Rated mtr i Arms is set to 100 Arms and Rated 134inim PU is set to 1.67, then the rated accelerating current of the motor is 167 Arms. |

| | |
|---|---|
| Inv I Limit % | **Visible only for Duty Type = 1**<br>**Un-visible only for "JIS Function 0/1" = 1. In this case, you need to input the "Engineer Passwrd" to be visible. Also you can check this setting by F12 " I% IA IR% IRA " of SVT monitor.**<br>Specifies the current limit for the inverter as a percentage of the full scale current for the drive. This also determines the overcurrent trip level, which is set at 105% of the current limit.<br>See fault: 100 Inv SW Oct |
| Cnv I Limit % | **Visible for Regen Drives Only**<br>Specifies the current limit for the converter as a percentage of the full scale current for the drive. This also determines the overcurrent trip level, which is set at 105% of the current limit.<br>See fault: 200 Cnv SW Oct |
| SX Pick Time ms | **Visible only for Duty Type = 1**<br>Specifies the amount of time allowed for the S relays to settle into the proper pick state (ms). The PWM will not be activated until this time has expired, so this parameter extends the time for run preparation. This timer may have to be increased if external relays are used between the drive and the motor.<br>See related faults: 403 Brake BY, 703 S Rly Fault, 704 DBD Fault. |
| Pos Corr Lim mm | **Visible only when "Interface Type" = 1.**<br>Specifies the maximum position correction allowed every 1 ms period. This is used to reduce any vertical vibration that may occur due to a large position correction. Such a large correction can occur if the signal latency of the PRS is large enough and the speed is high enough. Best results are achieved when this parameter is set less than 0.1 mm. |
| Max Battery I A | **Visible only for ARO Type > 1 or when Interface Type = 1**<br>This parameter specifies the maximum instantaneous battery current feedback (overcurrent threshold) allowed during ARO.<br>The software default value is:<br>30 A – for EN ERO<br>55 A – for Optimized ARO, ARU1 and ARU2. |
| AroMRo Delay Sec | **Visible only when "Interface Type" = 1**<br>This parameter controls the amount of delay before entering battery mode. It needs to be selected such that it allows the EMI capacitors in the drive to discharge sufficiently before connecting to the battery mode, i.e. dependent on drive type and controller. The delay time is communicated to the GECB that executes the delay -> see documentation of GECB/OpControl. |
| Vd out thresh PU | **Visible only for Duty Type = 1**<br>D-axis current regulator output threshold when the brake is not lifted yet. This is used to detect failed current sensors or disconnected motor from the drive as a result of wiring errors or relays not working etc. See fault 111 No Id fdbk.<br>The current default in the software is 0.9.<br>The recommended setting going forward is 0.5. |

| | |
|---|---|
| Id Thresh 400V | **Visible only for Duty Type = 1 and ARO Type = 2 or 5.**<br>This parameter is used when battery operation is active and the DC bus overvoltage control is active.<br>If DC BUS voltage is more than 400V within "CUR Limit T (sec)" with ARO, then the "Current Id" of motor is controlled by the drive.<br>If DC BUS voltage became more than **400V**, the "Current Id" has increment "Delta Id[A] /5ms" until "Max Id – 4 [A]".<br>Then, if DC BUS voltage exceeded **600V**, the "Current Id" has the increment "Delta Id[A] /5ms" until "Max Current Id".<br>Then, if DC BUS voltage became less than **590V**, the "Current Id" has the decrement "Delta Id[A] /5ms" until "3 [A]".<br><br>Delta Id[A] = ("Id Thresh 400v (A)" –2 ) / 50<br><br>Some logics of this function are reset at the beginning of every run. |
| Id Thresh 700V | **Visible only for Duty Type = 1 and ARO Type = 2 or 5.**<br>This parameter is used when battery operation is active and the DC bus overvoltage control is active.<br>If DC BUS voltage exceeded 700V, the "Current Id" has the increment "Delta Id[A] /5ms" until " Id Thresh 700V (A)".<br><br>Delta Id[A] = ("Id Thresh 400v (A)" –2 ) / 50<br><br>Some logics of this function are reset at the beginning of every run. |
| CUR Limit T(Sec) | **Visible only for Duty Type = 1 and ARO Type = 2 or 5.**<br>This parameter is used when battery operation is active and the DC bus overvoltage control is active.<br><br>See related parameter: **Id Thresh 400V**, **Id Thresh 700V** |
| DET SP MAX mm/s | **Visible only for "JIS Function 0/1" = 1 or HSOVF drives.**<br>This parameter is used for shock detection.<br>Start and stop Shock are detected during "Vel fbk < DET SP MAX mm/s". |
| ARO Vbus fil ms | **Visible only for Duty Type = 1 and ARO Type = 2 or 5.**<br>A filter was added to ignore the dc cap fail fault detection for 200 ms after MX pick on transition from JIS ARO to normal. This is in addition to the existing filter to switch between high and low thresholds when MX picks. See related fault: 208 Bus Cap Fail. |
| ARO V Flt Dly s | **Visible only for Duty Type = 1 and ARO Type = 2 or 5.**<br>Specifies the filter time of detected "301 DC Bus Under" for ARO of 428G. (HSOVF_ARO)<br>Detects the "301 DC Bus Under" if this filter time passes with a status under VDC threshold. |
| ARO Vbus Under % | **Visible only for Duty Type = 1 and ARO Type = 2 or 5.**<br>Specifies the threshold of "301 DC Bus Under" for ARO of 428G. (HSOVF_ARO)<br>Detects the "301 DC Bus Under" if VDC voltage is under this threshold during ARO. |

| | |
|---|---|
| Start Shock LVL% | **Visible only for "JIS Function 0/1" = 1 or HSOVF drives.**<br>This parameter is used for "start shock" detection.<br>"Shock flag" becomes "TRUE" with the following condition between the run start and "Vel fbk = DET SP MAX mm/s".<br><br>"Absolute Inv Iq Diff [A]" > "Shock Threshold [A]"<br>"Absolute Inv Iq Diff [A]" = "Inv Iq Ref_max" – "Inv Iq Ref_min"<br>"Inv Iq Ref_max": Max of "Inv Iq Ref" during the term for Start Shock.<br>"Inv Iq Ref_min": Min of "Inv Iq Ref" during the term for Start Shock.<br>"Shock Threshold [A]" = "Rated Trq I A" x "Start Shock LVL%"<br>Please see related fault 540 Shock Detect. |
| Stop Shock LVL% | **Visible only for "JIS Function 0/1" = 1 or HSOVF drives.**<br>This parameter is used for "stop shock" detection.<br>"Shock flag" becomes "TRUE" with the following condition between "Vel fbk = (DET SP MAX mm/s) x 0.9" and the run stoped in deceleration..<br><br>"Absolute Inv Iq Diff [A]" > "Shock Threshold [A]"<br>"Absolute Inv Iq Diff [A]" = "Inv Iq Ref_max" – "Inv Iq Ref_min"<br>"Inv Iq Ref_max": Max of "Inv Iq Ref" during the term for Stop Shock.<br>"Inv Iq Ref_min": Min of "Inv Iq Ref" during the term for Stop Shock.<br>"Shock Threshold [A]" = "Rated Trq I A" x "Stop Shock LVL%"<br>Please see related fault 540 Shock Detect. |
| NIARO Pdiv GAIN | **Visible only for ARO Type = 3.**<br>When the runs of NIARO with less than 700Vdc were changed from Normal run, the P Gain are adjusted by this parameter.<br>If this parameter is set "2", the P Gain is one half of Normal P Gain. |
| Self Tune 0/1 | **Visible only when " Motor Type" = 901 and when Duty Type = 1**<br>This parameter enables self-commissioning tests.<br>0 – disable self-commissioning<br>1 – enable self-commissioning |
| Vane Length mm | **Visible only when" Vane Sensor Type" = 99** (Custom PRS)**.**<br>Vane length, same for all vanes, variance of 80mm tolerated and learned (LR). |
| UIS config 0/1/2 | **Visible only when" Vane Sensor Type" = 99** (Custom PRS)**.**<br>0 – UIS sensor does not exist in this configuration (GDCB input open)<br>1 – UIS configured, position in "UIS offset mm" is above vane center<br>2 – UIS configured, position in "UIS offset mm" is below vane center |
| UIS offset mm | **Visible only when" Vane Sensor Type" = 99** (Custom PRS)**.**<br>Distance from vane center (= landing level) up/down to sensor position (when car is aligned with landing). |
| UIS NO=0 / NC=1 | **Visible only when" Vane Sensor Type" = 99** (Custom PRS)**.**<br>0 – UIS logic is "Normally Open", i.e. PRS output is closed (~24V) on vane<br>1 – UIS logic is "Normally Closed", i.e. PRS output is open (or 0V) on vane |
| LV1 config 0/1/2 | **Visible only when" Vane Sensor Type" = 99** (Custom PRS)**.**<br>LV1 configuration, corresponding to "UIS config 0/1/2" |
| LV1 offset mm | **Visible only when" Vane Sensor Type" = 99** (Custom PRS)**.**<br>LV1 offset, corresponding to "UIS offset mm" |
| LV1 NO=0 / NC=1 | **Visible only when" Vane Sensor Type" = 99** (Custom PRS)**.**<br>LV1 logic, corresponding to "UIS NO=0 / NC=1" |
| LV2 config 0/1/2 | **Visible only when" Vane Sensor Type" = 99** (Custom PRS)**.**<br>LV2 configuration, corresponding to "UIS config 0/1/2" |
| LV2 offset mm | **Visible only when" Vane Sensor Type" = 99** (Custom PRS)**.**<br>LV2 offset, corresponding to "UIS offset mm" |

| | |
|---|---|
| LV2 NO=0 / NC=1 | **Visible only when" Vane Sensor Type" = 99** (Custom PRS)**.**<br>LV2 logic, corresponding to "UIS NO=0 / NC=1" |
| DIS config 0/1/2 | **Visible only when" Vane Sensor Type" = 99** (Custom PRS)**.**<br>DIS configuration, corresponding to "UIS config 0/1/2" |
| DIS offset mm | **Visible only when" Vane Sensor Type" = 99** (Custom PRS)**.**<br>DIS offset, corresponding to "UIS offset mm " |
| DIS NO=0 / NC=1 | **Visible only when" Vane Sensor Type" = 99** (Custom PRS)**.**<br>DIS logic, corresponding to "UIS NO=0 / NC=1" |
| Custom HwCmp 0/1 | **Visible only when Interface Type = 1**<br>This parameter enables customization of the PRS and hoistway compensation.<br>0 – default compensation (usually sufficient)<br>1 – customized, compensation tuned by factors below<br>*Note: Setting this flag to 0 resets all tuning factors below to 100%.* |
| Latcy UisDisOn % | **Visible only when"Custom HwCmp 0/1" = 1 .**<br>Factor tuning the position feedback compensation for PRS signal latency of the UIS and DIS sensor moving onto a vane.<br>Example 150% : At each speed, the respective compensation Δs is 1.5 times of what the default compensation would be. -> 0% disables compensation. |
| Latcy UisDisOff% | **Visible only when"Custom HwCmp 0/1" = 1 .**<br>Factor tuning the position feedback compensation for PRS signal latency of the UIS and DIS sensor moving off a vane. -> 0% disables compensation. |
| Latcy 1/2LV on % | **Visible only when"Custom HwCmp 0/1" = 1 .**<br>Factor tuning the position feedback compensation for PRS signal latency of the 1LV and 2LV sensor moving onto a vane. -> 0% disables compensation. |
| Latcy 1/2LV off% | **Visible only when"Custom HwCmp 0/1" = 1 .**<br>Factor tuning the position feedback compensation for PRS signal latency of the 1LV and 2LV sensor moving off a vane. -> 0% disables compensation. |
| RopeStrtch comp% | **Visible only when"Custom HwCmp 0/1" = 1 .**<br>Factor tuning the position feedback compensation for rope/belt stretch caused by acceleration/deceleration. -> 0% disables compensation. |
| HitchPress comp% | **Visible only when"Custom HwCmp 0/1" = 1 .**<br>Factor tuning the position feedback compensation for hitch spring compression caused by acceleration/deceleration. -> 0% disables compensation. |
| Duty_kg % of car | **Visible only when"Custom HwCmp 0/1" = 1 .**<br>Factor adapting the position feedback compensation for rope/belt stretch and hitch spring compression to the impact of the load in the car. This value is set to the percentage of duty load related to the mass of the empty car.<br>Example: If empty car = 3200kg and duty load = 1600kg, this parameter should be set to Duty_kg % of car = 1600 / 3200 = 50% = 50 |
| PWM dnsft I % | **Visible only for Duty Type = 1**<br>This specifies the level of current, as a percentage of drive rated current, above which the PWM frequency of the inverter maybe downshifted by a factor of 2. In order to downshift, the motor frequency must also be less than the frequency specified by the parameter "PWM dnsftFreq Hz".<br>**Recommended values:**<br>= 60 for DRV_TYPE = 428<br>= 76 for DRIVERAT = 416<br>= 0 for DRV_TYPE = 460 and MOT_TYPE = 902<br>= 1 for DRV_TYPE = 460 and not MOT_TYPE = 902<br>= 100 for others |

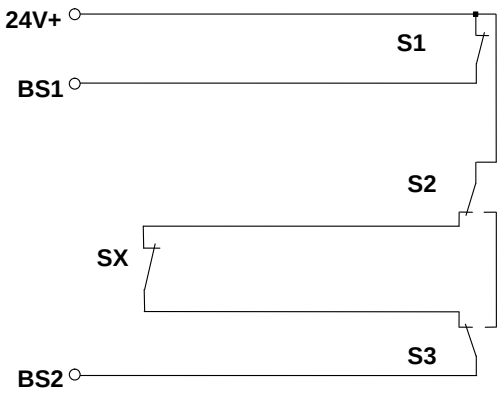
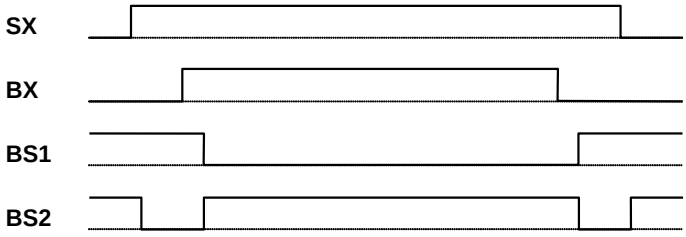
| | |
|---|---|
| PWM dnsftFreq Hz | **Visible only for Duty Type = 1**<br>This specifies the frequency below which the PWM frequency of the inverter maybe downshifted by a factor of 2. In order to downshift, the motor current must also be more than the level specified by the parameter "PWM dnsft I %".<br><br>To disable PWM downshifting altogether, set the parameter to zero. To allow PWM downshifting to be based only on the "PWM dnsft I %" parameter setting, set the "PWM dnsftFreq Hz" to 150.<br>**Recommended values:**<br>= 60 for DRV_TYPE = 428<br>= 5 for DRV_TYPE = 460 and MOT_TYPE = 902<br>= 2 for DRV_TYPE = 460 and not MOT_TYPE = 902<br>= 150 for others |
| Inv NTSD Ilimit% | **Applicable only to OVF460G**<br>The drive limit is extended to this setting during NTSD operation.<br>Default value = 88% = 850Arms for 460G<br>Original drive limit = 76% = 735Arms for 460G<br>Refer to the "Inv I Limit %". |
| ETSC Trip Vel % | **Applicable only to HSOVF**<br>Velocity threshold for ETSC function. |
| SSB Trip Vel % | **Applicable only to HSOVF**<br>Velocity threshold for SSB function. |
| CZ Drop Time ms | **Applicable only to HSOVF**<br>This is filtered time for Drop state of CZ Relay.<br>If CZ Drop state is passed this set time with Safety chain active, then "700 Safety Chain" is logged. |
| HitchLw emptyBOT | **Applicable only when** Load Weigh Type **= 2.**<br>Calibration value for interpreting hitch loadweighing data: This parameter allows manual modification of the calibration. At bottom position with empty car, the hitch load weighing device should send this value. The unit is kg. The actual value sent by the hitch load weighing device can be read using the menu Monitor-Motion, it is the first value in the display " HitchLW: Empty: "<br>This parameter is learned automatically during a learn run if the display string "Calibrate Hitch LoadW? Y=1/n=0" is confirmed by 1. |
| HitchLw emptyTOP | **Applicable only when** Load Weigh Type **= 2.**<br>Calibration value for interpreting hitch loadweighing data: This parameter allows manual modification of the calibration. At top position with empty car, the hitch load weighing device should send this value. The unit is kg. The actual value sent by the hitch load weighing device can be read using the menu Monitor-Motion, it is the first value in the display " HitchLW: Empty: "<br>This parameter is learned automatically during a learn run if the display string "Calibrate Hitch LoadW? Y=1/n=0" is confirmed by 1. |
| HitchLw full BOT | **Applicable only when** Load Weigh Type **= 2.**<br>Calibration value for interpreting hitch loadweighing data: This parameter allows manual modification of the calibration. At bottom position with duty load, the hitch load weighing device should send this value. The unit is kg. The actual value sent by the hitch load weighing device can be read using the menu Monitor-Motion, it is the first value in the display " HitchLW: Empty: "<br>This parameter is learned automatically during a learn run if the display string "Calibrate Hitch LoadW? Y=1/n=0" is confirmed by 1. |

| | |
|---|---|
| HitchLw CaliDone | **Applicable only when** Load Weigh Type **= 2.**<br>Enable/Disable the hitch load weighing calibration. If Load Weigh Type = 2 and HitchLw CaliDone = 0, the event message “915 LWSS not cal” is generated and the drive starts the run using default pretorque and “tight” velocity loop start gains.<br>This parameter is set automatically during a learn run if the display string “Calibrate Hitch LoadW? Y=1/n=0” is confirmed by 1. |
| Num LwSensorData | **Applicable only when** Load Weigh Type **= 2.**<br>This parameter indicates the number of data for load weight sensor and is used for the detection of failure or slackening of suspension.<br>This function is needed in Australian market when a system doesn’t have any “Slack rope switch”. But the system has to have a “Hitch Load Sensor “with “CAN interface”. According to Australian code (EN81 Code), the Drive control should stop if some ropes have trouble or it is out of a Driving sheave. The drive checks load data from Hitch Load Sensor for each rope. If the load data is very low compared with Normal data, an event of 728 Slack Rope is detected. Then the elevator is not able to run until serviced by engineer. Only the Inspection running is allowed for rescue operation even if the “Slack rope” is not solved.<br>This function is enabled by the parameter Num LwSensorData:<br>0: slack rope detection **disabled**.<br>1-8: slack rope detection **enabled**. |
| Remote Auth min | The drive has multiple levels of service tool feature access. The access level of the tool the user has connected to the drive determines the access level that will be granted to the user. The only exception is when a remote administrator temporarily raises the access level of the drive to L2, allowing a user with a L1 tool connected locally in the machine room to gain L2 access.<br><br>This parameter is the “Remote Authentication Timer”. When the timer is nonzero, the access level is increased from level 1 to level 2. The timer default is zero. The timer can be set non-zero only by admin access level. Its range is limited 0 to 65535 min (approximately 45 days). The timer is visible by level 2 access and can be lowered or cleared by L2 access. |
| MaskOut Warning1 | Event number to be masked out of the event log. Setting this parameter to 0 means “no events to be masked out”. Only selected events of the response types INFO and WARN can be masked out, see event description. Non-maskable events will not be accepted by the input menu of this parameter. If this parameter is non-zero, the event log will display “Filter is on!” as its first entry. The filter created by this parameter is effective only for future events, not for events already stored when the parameter is set.<br>**If MaskOut Warning1:= 0, the parameter MaskOut Warning2 is cleared (=0) and hidden.** |
| MaskOut Warning2 | Event number to be masked out of event log, analog to MaskOut Warning1.<br>**If MaskOut Warning1:= 0, this parameter is cleared (=0) and hidden.** |
| Fan Duty Idle % | **Visible only when “Interface Type” = 1 and drive OVFR02A-412 detected**<br>For LVA – GeN2 Premier at 3 & 3.5 m/s the drive is installed in the hoistway. The noise of the fan during idle can be reduced by reducing the fan PWM duty. |

### 6.7.3 3-3 BRAKE

| SVT Display | Description |
|---|---|
| BRK TRQ %Load1 | **Visible only for when brake torque test is active**<br>This parameter is used only for Brake Maintenance Test.<br>Sets this parameter for load in percent<br>100%:Duty load in car is 100%<br>ICD: Interface Type=3 Drive Command(DC2) Bit3=0<br>OPB: DriveBtiControlCommand > BtiParameter: bit0 = 0 |
| BRK TRQ %Load2 | **Visible only for when brake torque test is active**<br>This parameter is used only for Brake Maintenance Test.<br>Sets this parameter for load in percent<br>100% :Duty load in car is 100%<br>ICD: Interface Type=3 Drive Command(DC2) Bit3=1<br>OPB: DriveBtiControlCommand > BtiParameter: bit0 = 1 |
| In Car noLoad kg | Sets a threshold of “noload in car” to perform the BTI test<br>Min: 80, Max: 200 |
| Self BTI Block | Sets Enable or Disable of Self-BTI test<br>0: Normal setting (Enabled Self-BTI)<br>1: Disable Self-BTI<br>2: Blocked Self-BTI (Cannot change this parameter until canceled)<br>** This Block is canceled only for good result of Manual BTI test or special command required.After Block canled, this parameter is automatically change from “2” to “0”. |
| Check Unbalance | Uses a calculation value of unbalance load in BTI test<br>0: Disable , 1: Enable<br>Recommendation is to adjust the unbalance load manually by “unbalance load adjustment” with no-load condition before Self-BTI implemented.<br>Then this function is set to disable “0”.<br>See 6.9.5 How to check the balanced load? (For PM machine) |
| Lockup by S-BTI | Sets Enable or Disable of lockup operation for Self-BTI test<br>0: Disble , 1 : Enable<br>For Enable: If the self-BTI test result is not good, the drive blockany attemps run except TCI/ERO operation. |
| Brk DelayTime ms | Sets a threshold value of Brake Delay Detection.<br>0: Disable (This value is 0 automatically if it is set to less than 1499)<br>Min: 1500, Max:10000<br>( This value has to be set to 1500 for JIS application) |
| BrkTrqOffset kgm | **Visible only for when brake torque test is active**<br>This parameter is used only for Brake Maintenance Test.<br>Correction data for Iq_reference of “Brake maintained torque” |
| BRK TRQ Trim % | **Visible only for when brake torque test is active**<br>This parameter is used only for Brake Maintenance Test.<br>This is the parameter to adjust a condition of the job site.<br>The default value is 100%.<br>Min: 50 , Max : 150 |
| ZERO SPEED2 mm/s | **Visible only for when brake torque test is active**<br>This parameter is used only for Brake Maintenance Test.<br>The threshold to detect the motor running |
| RATE BRK TRQ kgm | **Visible only for when brake torque test is active**<br>This parameter is used only for Brake Maintenance Test.<br>“Brake maintained torque” of 100% load when JIS Option Mode is set to “98” as test mode. |

| | |
|---|---|
| BRK TRQ MODE | **Visible only for when brake torque test is active**<br>This parameter is used only for Brake Maintenance Test.<br>0 :System test<br>1 :Only Motor test, not system |
| BCM present 0/1 | **Applicable only to HSOVF**<br>0: Not used for the Brake Control Module<br>1: Brake PWM control is enable |
| Int Brk Type 0-4 | **Visible only for drive types with internal brake control capability.**<br>Specifies which brake control to use:<br>0 – external brake module used<br>1 – internal brake control circuit used<br>2 – internal closed-loop PWM brake control circuit used (416CR)<br>3 – RESERVED<br>4 – Voltage control (open-loop PWM with Pick/Hold) for BPCB (416CR)<br>The brake current can be monitored in the service tool with the display parameter Brake Current A. |

| | |
|---|---|
| Brk Sw Type 0-6 | **Visible only when NOT GEN2 machine (See "Motor Type")**<br>Specifies the type of brake switches present:<br>0 – brake switches not present, requires BS1= Gnd, BS2=Gnd.<br>1 – 2 brake switches present<br>2 – 2 brake switches present, with inverted signals<br>3 – 3 brake switches present working to 2 inputs BS1 and BS2:<br>  <br><br>  <br><br>4 – **Brake switches not present, requires BS1=Gnd, BS2=+24V.**<br>Some PMSM machines & brakes are designed to work safe without brake switch monitoring (e.g. REIVAJ PMSM machines). To prevent that a different motor type is operated without brake switches, a separate brake switch type has been created with a fixed input configuration. This input configuration is used to ensure that the correct motor type is connected to the controller. In case of a different wiring the drive software does not allow the motor to run.<br>5 – BS1 = Normally close contact, BS2 = Normally open contact<br>Applicable for 41T machine<br>A – BS1 = Normally close contact, BS2 = Always closed contact<br>Applicable for the brake test of 41T machine<br>In this case, a brake is compulsorily being opened with opening bolt.<br>See fault 400 Brake S1 SAS. |

| | |
|---|---|
| Brk Pick Time ms | **Visible only for Duty Type = 1**<br>Specifies the time allowed for the brake switches to settle into the proper pick state (ms) (beginning with the command to pick). This parameter must be set greater than the actual brake pick time plus the time allowed for brake switch debouncing as specified by the setup parameter Brk Lftd Dely ms.<br>See fault 400 Brake S1 SAS. |
| Brk Setl Time ms | **Visible only for Duty Type = 1**<br>Time allowed for brake switches to settle into proper drop state (ms).<br>See fault 400 Brake S1 SAS. |
| Lft Brk Delay ms | **Visible only for Duty Type = 1**<br>Time to delay lift brake command to allow for pre-torquing (ms). |
| Brk Lftd Dely ms | **Visible only to systems that have brake switches, i.e., "Brk Sw Type 0-6" is set to 1, 2, or 3.** For each switch, this parameter specifies the amount of debounce for the brake switch signal during brake pick. The default value is 30ms. "Brake Lifted" will not become TRUE until after the debounce time.<br><br>For slowly picking brakes, the parameter value can be increased to allow time for the brake to fully pick before the drive declares the brake is lifted and advances the state machine. Note that if this parameter value is increased, the corresponding parameter Brk Pick Time ms may also have to be increased accordingly.<br><br>For the brake drop, the debounce value is fixed at 30ms and is not adjustable. |
| Brk ramp up t ms | **Applicable only for "234, 428 or 460 drives" and "BCM present 0/1 = 1" or "Int Brk Type 0-4 = 2"**<br>The amount of time taken to ramp the brake current to the pick current. |
| Brk ramp dn t ms | **Applicable only for "234, 428 or 460 drives" and "BCM present 0/1 = 1" or "Int Brk Type 0-4 = 2"**<br>The time for ramp down of brake current from hold current to zero. |
| Brk hold Dely ms | **Applicable only for "234, 428 or 460 drives" and "BCM present 0/1 = 1" or "Int Brk Type 0-4 = 2"**<br>Time to hold the "brake pick current" after "Brake Lifted". |
| Brk Pick A | **Applicable only for "234, 428 or 460 drives" and "BCM present 0/1 = 1" or "Int Brk Type 0-4 = 2"**<br>**Un-visible for when Motor Type is set to 711-716/PM138 or 731-734/PM30T or 723-727/BOMCO3.**<br>This is the current used to lift the brake. This current is reached during the break ramp time before the current is switched to the Brake hold current. |
| Brk Pick % | **Applicable only for "234, 428 or 460 drives" and "BCM present 0/1 = 1" or "Int Brk Type 0-4 = 2"**<br>**Un-visible for when Motor Type is set to 711-716/PM138 or 731-734/PM30T or 723-727/BOMCO3.**<br>Threshold to shift from pick current to Hold current. If Brake current feedback is over this threshold, the Brake control is moved to Hold current. |
| Brk Hold A | **Applicable only for "234, 428 or 460 drives" and "BCM present 0/1 = 1" or "Int Brk Type 0-4 = 2"**<br>**Un-visible for when Motor Type is set to 711-716/PM138 or 731-734/PM30T or 723-727/BOMCO3.**<br>The hold current for the brake. This is the current that is used to hold the brake in the lifted position. |
| Brk Drop % | **Applicable only for "234, 428 or 460 drives" and "BCM present 0/1 = 1" or "Int Brk Type 0-4 = 2"**<br>When ramping down and the DSP to current feedback reaches this value, drop the brake contactor. |

| | |
|---|---|
| Brk Bus OVT % | **Applicable only for "234, 428 or 460 drives" and "BCM present 0/1 = 1"**<br>Trip point set as percentage of brake pick current to declare a Brake bus overvoltage fault. |
| Brk OCT A | **Applicable only for "234, 428 or 460 drives" and "BCM present 0/1 = 1" or "Int Brk Type 0-4 = 2"**<br>**Un-visible for when Motor Type is set to 711-716/PM138 or 731-734/PM30T or 723-727/BOMCO3.**<br>Trip point set as feedback current to declare a Brake current over fault. |
| Brk Bus UVT % | **Applicable only for "234, 428 or 460 drives" and "BCM present 0/1 = 1"**<br>Trip point set as percentage of brake pick current to declare a Brake bus undervoltage fault. |
| Brk Nom DC V | **Applicable only for "234, 428 or 460 drives" and "BCM present 0/1 = 1" or "Int Brk Type 0-4 = 2"**<br>The nominal voltage on the brake DC link. This value is a result of the input AC line voltage and the ratio of the brake transformer. This parameter is used to scale the gains in the brake current regulator. |
| Brk dcv fscale V | **Applicable only for "234, 428 or 460 drives" and "BCM present 0/1 = 1"**<br>When the inside of the DSP carries out an operation, brake bus voltage full scale. |
| Brk Crr fscale A | **Applicable only for "234, 428 or 460 drives" and "BCM present 0/1 = 1"**<br>When the inside of the DSP carries out an operation, current full scale. |
| Brk R ohm | **Applicable only for "234, 428 or 460 drives" and "BCM present 0/1 = 1" or "Int Brk Type 0-4 = 2"**<br>**Un-visible for when Motor Type is set to 711-716/PM138 or 731-734/PM30T or 723-727/BOMCO3.**<br>Brake resistance value in ohms. |
| Brk L H | **Applicable only for "234, 428 or 460 drives" and "BCM present 0/1 = 1" or "Int Brk Type 0-4 = 2"**<br>**Un-visible for when Motor Type is set to 711-716/PM138 or 731-734/PM30T or 723-727/BOMCO3.**<br>Brake inductance value in henry. |
| Brk I bw pick Hz | **Applicable only for "234, 428 or 460 drives" and "BCM present 0/1 = 1" or "Int Brk Type 0-4 = 2"**<br>**Un-visible for when Motor Type is set to 711-716/PM138 or 731-734/PM30T or 723-727/BOMCO3.**<br>Bandwidth for Brake PI control during picking or dropping brake |
| Brk I bw hold Hz | **Applicable only for "234, 428 or 460 drives" and "BCM present 0/1 = 1" or "Int Brk Type 0-4 = 2"**<br>**Un-visible for when Motor Type is set to 711-716/PM138 or 731-734/PM30T or 723-727/BOMCO3.**<br>Bandwidth for Brake PI control during holding brake |
| Brk War Det Cnt | **Visible only when "Interface Type" = 1 and "JIS Function 0/1" = 1**<br>When the "420 Bk Dly DetW" was detected, the Drive moves to the IDLE state. The drive repeats a re-try running with the cycle of this parameter value. |
| Brk Pick V % | **Visible only when "Int Brk Type 0-4" = 4**<br>This specifies the pick voltage in % when brake control is open loop voltage PWM control "Int Brk Type 0-4 = 4. |
| Brk Hold V % | **Visible only when "Int Brk Type 0-4" = 4**<br>This specifies the hold voltage in % when brake control is open loop voltage PWM control "Int Brk Type 0-4 = 4. |

| | |
|---|---|
| Sequenced Brk0/1 | **Visible only when "Interface Type" = 1 and drive OVFR02A-412 detected**<br>For LVA – GeN2 Premier at 3 & 3.5 m/s with machines TAA20220AT41 or TAA20220AT43 ("Motor Type " = 511):<br>The additional Soft Brake Snubber Board switches diodes to one or both brake coil circuits to avoid passenger discomfort after ES. The control of the SBSB is done depending on the load via the 24V I/O P5.5 and P6.6.<br>"Sequenced Brk0/1" = 0: Only Pick/Hold for the brake, no sequenced braking<br>"Sequenced Brk0/1" = 1: Pick/Hold and sequenced braking are enabled. |
| SBSB Vel mm/s | **Visible only when "Sequenced Brk0/1" = 1**<br>The sequenced braking is only enabled at normal runs above this speed. Otherwise both diodes are disabled. |
| SBSB Motor Trq % | **Visible only when "Sequenced Brk0/1" = 1**<br>Additional diodes are switched to both brake coil circuits if the motor torque current at start exceeds this limit. |
| SBSB Regen Trq % | **Visible only when "Sequenced Brk0/1" = 1**<br>One diode is switched to one brake coil circuit if the motor torque current at start exceeds this limit. Otherwise both diodes are disabled. |

## 6.7.4 3-4 MACHINE

The following parameters are visible only when parameter **Motor Type** is set to 901 or 902. These parameters are used only if the motor is not included in the list of predefined motors in Section 9. If **Motor Type** is NOT set to 901 or 902, these parameters are automatically set according to predefined motors in Section 9 and cannot be modified.

| SVT Display | Description |
|---|---|
| Mtr Shft Pwr kW | **Visible only when "Self Tune 0/1" = 1**<br>This parameter is used when the drive is in self-tune mode only. Enter the motor power in kilowatts shown on the motor nameplate. |
| Rtd Mtr Spd RPM | **Visible only when "Self Tune 0/1" = 1**<br>This parameter is used when the drive is in self-tune mode only. Enter the rated motor speed in rpm shown on the motor nameplate. Do not enter the contract rpm. |
| Rtd Mtr Ln-Ln V | **Visible only when "Self Tune 0/1" = 1**<br>This parameter is used when the drive is in self-tune mode only. Enter the rated motor voltage shown on the motor nameplate. |
| Rtd Mtr I rms | **Visible only when "Self Tune 0/1" = 1**<br>This parameter is used to calculated rated magnetizing and rated torque current in case the measurement-based calculation fails. |
| Rtd Mtr Freq Hz | **Visible only when "Self Tune 0/1" = 1**<br>This parameter is used when the drive is in self-tune mode only. Enter the rated motor frequency in Hertz shown on the motor nameplate. |
| LR Ampl KP/Ki PU | **Visible only when "Self Tune 0/1" = 1**<br>Parameter used by self-commissioning. This limits the drive current **during the locked-rotor Kp and Ki portion** of the self commissioning tests. This value should be set to 0.2, which corresponds to 20% of the rated drive current. |
| LR Ampl RTC PU | **Visible only when "Self Tune 0/1" = 1**<br>Parameter used by self-commissioning. This limits the drive current **during the locked-rotor RTC portion** of the self commissioning tests. This value should be set to 0.35, which corresponds to 35% of the rated drive current. |

| | |
|---|---|
| Mtr Lsigma mH | **Visible only when "Self Tune 0/1" = 1**<br>This parameter is used when the drive is in self-tune mode only. Enter the motor transient inductance ($L_\sigma$) if known. If not known, enter 0.001. The drive will determine this value during the self-commissioning tests |
| Self Tune Config | **Visible only when "Self Tune 0/1" = 1**<br>*This parameter should only be used after consultation with engineering. This parameter should be used only if the default settings for self commissioning fail or result in unsatisfactory results.*<br>This parameter sets the self tune test configuration and specifies which tests will run.<br>0 – *default test configuration*; determines locked rotor RTC using *real* impedence.<br>1 – enable frequency sweep test during locked rotor test<br>2 – determine locked rotor RTC using *imaginary* impedenece<br>3 – determine locked rotor RTC using *imaginary* impedenece and enable frequency sweep test<br>4 – Determine inertia using only speed criteria (speed > ½ rated speed). Otherwise, the default for the inertia test is to use only the deceleration portion of the run. |
| Low Volt Op 0/1 | **QUALIFIED FOR USE WITH LCRD 403 AND 404 ONLY.**<br>**Visible only when" Motor Type" = 901 or 902**<br>Specifies that the motor is a low voltage motor as typically found in modernization. When set to 1, the converter regulates the DC bus to the rectified AC line voltage and sets the PWM frequency to 8KHz.<br>0 – Low voltage operation for modernization **disabled**.<br>1 – Low voltage operation for modernization **enabled**. |
| Geared StrJR 0/1 | **Visible only when" Motor Type" = 901 or 902 and Interface Type = 1.**<br>This parameter is set to 1 only for certain geared applications in China that have extremely low gear box efficiencies, and works only for CAN based systems, but not 422 based systems.<br><br>Setting this parameter to 1 enables a modification to the pretorque in which the pretorque is scaled by the parameter "Pretorque Trim2%" for regenerative runs only. For non-regenerative runs, the pretorque is scaled by the parameter "Pretorque Trim %". This allows pretorque to be adjusted in a non-linear fashion to account for non-linearities in certain worm-gear machine. |
| Number of Poles | **Visible only when" Motor Type" = 901 or 902**<br>Specifies the number of poles of the motor. |
| Rated Trq Nm | **Visible only when" Motor Type" = 901 or 902**<br>Specifies the torque produced by the motor at the rated torque current (and rated magnetizing current when using an induction motor). |
| Rated Trq I A | **Visible only when" Motor Type" = 901 or 902**<br>Rated torque current (peak value). |
| Ld mH | **Visible only when" Motor Type" = 901 or 902**<br>Specifies the transient inductance in the d-axis of the motor, including any filter inductance. The value represents the per-phase equivalent circuit of the motor and filter. |
| Lq mH | **Visible only when" Motor Type" = 901 or 902**<br>Specifies the bulk inductance in the q-axis of the motor. For induction motors, Ld should be set equal to Lq. |

| | |
|---|---|
| R Ohm | **Visible only when" `Motor Type`" = 901 or 902**<br>Specifies the equivalent resistance of the motor including any filter resistance. This parameter is used to set the integral gain of the current regulators, and should be adjusted to achieve desired performance of the regulators. |
| T/A Slope % | **Visible only when" `Motor Type`" = 902**<br>This parameter and the next are used to achieve the maximum torque per amp in a PM motor by modifying the d-axis current reference as a function of q-axis current. This achieves higher motor efficiency. The parameter specifies the percentage change in d-axis current per unit change of q-axis current. The equations are:<br>$$I_d = -\frac{TA_{slope}}{100}\left(|I_q| - |TA_{offset}|\right), |I_q| > |TA_{offset}|$$<br>$$I_d = 0, |I_q| \le |TA_{offset}|$$<br>To disable this feature, set this parameter to zero. |
| T/A Offset A | **Visible only when" `Motor Type`" = 902**<br>See previous parameter. This parameter specifies the amount of q-axis current below which d-axis current is zero. |
| Kt Slope 1/kNm | **Visible only when" `Motor Type`" = 902**<br>This parameter is used to modify the torque gain of the inner velocity loop. This accounts for the change in the actual torque gain of the machine during field weakening to ensure consistent velocity loop performance. The parameter specifies the amount of change in the d-axis current (defined in A) per unit change in the inverse of the torque constant (defined in A/kNm). The reason that the units is in A per kNtm is due to the fact that this parameters tends to be small to be able to enter from the SVT. To disable this feature, set this parameter to zero. |
| Id Saturation A | **Visible only when" `Motor Type`" = 902**<br>This parameter specifies the negative d-axis current level at which the d-axis motor inductance begins to saturate. Below this current level, the inductance is treated as constant and is specified by the parameter:<br>`Ld mH` |
| Iq Saturation A | **Visible only when" `Motor Type`" = 902**<br>This parameter specifies the absolute q-axis current level at which the q-axis motor inductance begins to saturate. Below this absolute current level, the inductance is treated as constant and is specified by the bulk inductance parameter: `Lq mH` |
| Ld Slope mH/A | **Visible only when" `Motor Type`" = 902 and "Drive Type" is NOT 428 and 460.**<br>This parameter is used to modify the proportional gain of the d-axis current regulator. This accounts for the change in the actual inductance of the machine due to saturation of the motor iron to ensure consistent current regulator performance. This parameter specifies the reduction in inductance per unit increase in d-axis current. To disable this feature, set this parameter to zero. |
| Lq Slope mH/A | **Visible only when" `Motor Type`" = 902 and "Drive Type" is NOT 428 and 460.**<br>This parameter is similar to the previous parameter, except it applies to the q-axis instead of the d-axis of the motor. |

| | |
|---|---|
| Ld Slope uH/A | **Visible only when" Motor Type" = 902 and "Drive Type" = 234, 428 or 460.** This parameter is used to modify the proportional gain of the d-axis current regulator. This accounts for the change in the actual inductance of the machine due to saturation of the motor iron to ensure consistent current regulator performance. This parameter specifies the reduction in inductance per unit increase in d-axis current. To disable this feature, set this parameter to zero. |
| Lq Slope uH/A | **Visible only when" Motor Type" = 902 and "Drive Type" = 234, 428 or 460.** This parameter is similar to the previous parameter, except it applies to the q-axis instead of the d-axis of the motor. |
| Lq0 mH | **Visible only when" Motor Type" = 902** The parameters Lq0, Lq1 and Lq2 affect the accuracy of the encoder position error fault management only. These parameters are coefficients of a polynomial curve fit of the q-axis bulk inductance, which is used to calculate the q-axis bulk inductance value of the motor at a given operating point. The resulting q-axis bulk inductance is used as an input to the Secondary Magnet Position estimator, which is used to detect encoder slip. If these parameter values are not known, then set Lq0 = Lq, and set Lq1 = Lq2 = 0. This makes the bulk inductance equal to the nominal value of incremental inductance Lq. See related fault detection: 504 Enc Pos Err. |
| Lq1 1/mA | See previous parameter. |
| Lq2 1/mA^2 | See previous parameter. |
| Ld0 mH | **Visible only when" Motor Type" = 902** The parameter Ld0 is used to tune the field weakening motor voltage regulator. It is important this value is correct to guarantee that the drive can provide the necessary bandwidth in controlling the motor voltage as a result of back emf due to magnets and resistive voltage drop due to currents. Set Ld0 = Ld if the exact value is not known. |
| Rated Mag I A | **Visible only when" Motor Type" = 901** Specifies the rated magnetizing current when using an induction motor (peak value, not RMS). |
| Peak Mag I A | **Visible only when" Motor Type" = 901** Specifies the peak value (not RMS) to which the d-axis magnetizing current is ramped during magnetization when using an induction motor. If this parameter is set larger than the rated magnetizing current, then fast fluxing of the motor occurs. Once the motor is fluxed, the magnetizing current is ramped down to the rated magnetizing current. As this parameter is increased, flux time decreases (hence "fast fluxing") which may improve elevator flight time. If this parameter is equal to or smaller than the rated magnetizing current, then fast fluxing does not occur and the magnetizing current simply ramps up to the rated magnetizing current. |
| Rtr Time Const s | **Visible only when" Motor Type" = 901** Specifies the rotor time constant in seconds when using an induction motor. |
| Max Flux time s | **Visible only when" Motor Type" = 901(Induction Motor)** This parameter sets the time which returns RTR. The Pre-torque should be secured till brake is opened. There is possibility that the vibration originates in the time of the start when the time is short. |

| | |
|---|---|
| Rated Motor rpm | **Visible only when" Motor Type" = 901 or 902**<br>Specifies the true rated rpm of the motor independent of a particular elevator application. This parameter is used to set the velocity threshold for the "504 Enc Pos Err" fault management. This fault management becomes active when either the velocity command or the velocity feedback is greater than 30% of this parameter setting. For future software releases, this parameter will also be used for a self-commissioning feature for both induction and PM motors.<br>See fault: 504 Enc Pos<br>See EEPROM parameter: Mag err thr eDeg<br>See display parameter: MagErr1 MagErr2 |
| Mag err thr eDeg | **Visible only when" Motor Type" = 902**<br>This parameter specifies the allowable difference between the magnet position derived from the encoder and the result of the Locked Rotor Test (LRT), and the estimated position of the magnets based on the back-EMF of the motor.<br>See fault: 504 Enc Pos<br>See display parameter: MagErr1 MagErr2<br>See EEPROM parameter: Rated Motor rpm |
| LRT AC Level PU | **Visible only when" Motor Type" = 902**<br>Specifies the AC current offset to be used during the Locked Rotor Test (LRT). It is specified in per unit of the rated motor torque (Rated Trq I A). It is subject to a minimum of 4% of the full-scale current of the drive (see Drive Type). |
| ARD LRT AC Lv PU | **Visible only when" Motor Type" = 902**<br>Specifies the AC current offset to be used during the Locked Rotor Test (LRT) **during ARD**. It is specified in per unit of the rated motor torque (Rated Trq I A).<br><br>During ARD operation with the 60A and 120A drives, the drive cannot operate the ARD function. This is because the LRT AC level is too high during the ARD operation. The ARD LRT AC level parameter can change the LRT AC level to a smaller value than the default LRT AC Level value. Then the ARD operation can start without any power issue in ARD system. |
| LRT DC Level PU | **Visible only for PM motors.**<br>Specifies the DC current offset to be used during the Locked Rotor Test (LRT). It is specified in per unit of the rated motor torque (Rated Trq I A). It is subject to a minimum of 4% of the full-scale current of the drive (see Drive Type). |
| LRT mot err eDeg | **Visible only for PM motors.**<br>During the locked rotor test to ensure the brake is dropped, there is a minimum allowable variation that the encoder can move. This is specified in electrical degrees with this parameter. This could occur when the brake is loose or when the locked rotor test current is producing significant torque as a result of unmatched brake-motor combination.<br>If the minimum is exceeded, the fault 503 LRT Motion will be logged. |
| Fld Wkn Lvl % | The Field Weakening Controller (FWC) is a voltage regulator that allows higher motor speeds without exceeding maximum sinusoidal inverter output voltage and is applicable to PM motors only. This parameter specifies the voltage level at which the FWC begins to dictate negative d-axis current. This parameter is a percentage of the maximum sinusoidal output voltage, which is equal to the bus voltage divided by sqrt(2) minus some small voltage drops due to the impedance of the IGBTs (line-to-line rms). This parameter is typically set to 100, which equals a 513 V line-to-line rms drive output. To disable the FWC, set this parameter to 200. |

| | |
|---|---|
| Fld Wkn BW Hz | **Visible only for PM motors.**<br>The Field Weakening Controller (FWC) is a voltage regulator that allows higher motor speeds without exceeding maximum sinusoidal inverter output voltage and is applicable to PM motors only. This parameter specifies the bandwidth of this regulator. This parameter is set typically to 10 Hz, but may be lowered down to about 2.5 Hz for certain motor applications with a low electrical frequency depending on 151inimum151nce. |
| Inv Hrmnc On 0/1 | **Visible only for PM motors.**<br>This parameter turns the inverter 6th harmonic inverter current regulator for the PM machine. The default is turned off as a comprehensive tuning process is needed if deemed necessary. The parameter for all predefined motor types is turned off except motor type 104 (Date 5/21/2010). In the feature it can be turned on if the tuning is done for the specific motor. It is suggested to be set to 0 If the user defined motor 902 is used. |
| Inv Hrmnc dS % | **Visible only for PM motors and the Inv Hrmnc On 0/1 is set to 1.**<br>This defines the amount of d axis current in phase with the magnet position as percentage of torque current reference. Note that negative values indicates 180 degrees phase shift to allow greater tuning flexibility. |
| Inv Hrmnc dC % | **Visible only for PM motors and the Inv Hrmnc On 0/1 is set to 1.**<br>This defines the amount of d axis current in quadrature with the magnet position as percentage of torque current reference. Note that negative values indicates 180 degrees phase shift to allow greater tuning flexibility. |
| Inv Hrmnc qS % | **Visible only for PM motors and the Inv Hrmnc On 0/1 is set to 1.**<br>This defines the amount of q axis current in phase with the magnet position as percentage of torque current reference. Note that negative values indicates 180 degrees phase shift to allow greater tuning flexibility. |
| Inv Hrmnc qC % | **Visible only for PM motors and the Inv Hrmnc On 0/1 is set to 1.**<br>This defines the amount of q axis current in quadrate with the magnet position as percentage of torque current reference. Note that negative values indicates 180 degrees phase shift to allow greater tuning flexibility. |

### 6.7.5 3-5 PROFILE

| SVT Display | Description |
|---|---|
| Man Speed mm/s | **Visible only when "Interface Type" = 0,2,3,4**<br>Speed during manual mode operation. |
| Man Acc mm/s2 | **Visible only when "Interface Type" = 0,2,3,4**<br>Acceleration during manual mode operation. |
| Man Dec mm/s2 | **Visible only when "Interface Type" = 0,2,3,4**<br>Deceleration during manual mode operation. |
| Insp Speed mm/s | **Visible only when "Interface Type" = 1**<br>Speed at inspection run.<br>Note: Value may be changed to 300 by the system's auto-installation routines.<br>Note: Insp speed traveling towards the end of the hoistway within an LS is limited to 0.15m/s:<br>• For the complete length of the LS if position is invalid.<br>• For the last 2m before the terminal landing if position is valid. |
| Nom Speed mm/s | **Visible only when "Interface Type" = 1**<br>Nominal speed.<br>Note: this automatically sets "Corr Speed mm/s" when changed, except for JIS.<br>Note: If **"TwoStepSpeed 0/1" = 1,** this parameter is used increased speed(High speed) |
| Accel mm/s2 | **Visible only when "Interface Type" = 1**<br>Nominal acceleration rate. |

| | |
|---|---|
| Decel mm/s2 | **Visible only when "Interface Type" = 1**<br>Nominal deceleration rate. |
| Min Tdecel mm/s2 | **Visible only when "Interface Type" = 1**<br>Minimum timed deceleration slope. It is used in the NTSD check or as timed decel fault reaction if "Min Tdecel mm/2" > (115%*"Decel mm/s2"), otherwise 115%*"Decel mm/s2" is used. Adjusting "Min Tdecel mm/2" > (115%*"Decel mm/s2") helps to get shorter LS length and faster failure reaction than with regular profile, at the cost of increased drive/motor current. |
| Jerk mm/s3 | **Visible only when "Interface Type" = 1**<br>Nominal jerk rate. |
| Numb AltProfiles | **Visible only when "Interface Type" = 1**<br>Number of selectable alternate speed profiles. The actually used speed profile is then determined by the OCSS (e.g. GECB) before every start of run. |
| Alt1 Speed mm/s | **Visible only when "Interface Type" = 1 and "Numb AltProfiles" => 1**<br>Constant speed when alternate profile 1 is used.<br>Note: Set automatically to Nom Speed mm/s when invisible. |
| Alt1 AcDec mm/s2 | **Visible only when "Interface Type" = 1 and "Numb AltProfiles" => 1**<br>Acceleration & deceleration rate when alternate profile 1 is used.<br>Note: Set automatically to Accel mm/s2 or Decel mm/s2 (whatever is lower) when invisible. |
| Alt1 Jerk mm/s3 | **Visible only when "Interface Type" = 1 and "Numb AltProfiles" => 1**<br>Jerk rate when alternate profile 1 is used.<br>Note: Set automatically to Jerk mm/s3 when invisible. |
| Alt2 Speed mm/s | **Visible only when "Interface Type" = 1 and "Numb AltProfiles" => 2**<br>Constant speed when alternate profile 2 is used.<br>Note: Set automatically to Nom Speed mm/s when invisible. |
| Alt2 AcDec mm/s2 | **Visible only when "Interface Type" = 1 and "Numb AltProfiles" => 2**<br>Acceleration & deceleration rate when alternate profile 2 is used.<br>Note: Set automatically to Accel mm/s2 or Decel mm/s2 (whatever is lower) when invisible. |
| Alt2 Jerk mm/s3 | **Visible only when "Interface Type" = 1 and "Numb AltProfiles" => 2**<br>Jerk rate when alternate profile 2 is used.<br>Note: Set automatically to Jerk mm/s3 when invisible. |
| Alt3 Speed mm/s | **Visible only when "Interface Type" = 1 and "Numb AltProfiles" => 3**<br>Constant speed when alternate profile 3 is used.<br>Note: Set automatically to Nom Speed mm/s when invisible. |
| Alt3 AcDec mm/s2 | **Visible only when "Interface Type" = 1 and "Numb AltProfiles" => 3**<br>Acceleration & deceleration rate when alternate profile 3 is used.<br>Note: Set automatically to Accel mm/s2 or Decel mm/s2 (whatever is lower) when invisible. |
| Alt3 Jerk mm/s3 | **Visible only when "Interface Type" = 1 and "Numb AltProfiles" => 3**<br>Jerk rate when alternate profile 3 is used.<br>Note: Set automatically to Jerk mm/s3 when invisible. |
| Corr Speed mm/s | **Visible only when "Interface Type" = 1**<br>Speed used for correction runs. Automatically set when "Nom Speed mm/s" is changed. Notes:<br>- Upper limit is actual value of "Nom Speed mm/s" resp. 2000 mm/s.<br>- A lower limit of 500 is recommended because of thermal concern for longer correction runs.<br>- Parameter DDP sec has to be adjusted if necessary. |

| | |
|---|---|
| Base Speed % | **Visible only when "Interface Type" = 1**<br>This parameter is a profile adjustment parameter. Nominally it is set to 75%. Its main function is to start removing the acceleration (jerking out of constant acceleration or jerking into constant velocity) at a point where the speed is 75% (or the value entered by the user/operator) of the nominal speed. The main purpose of this parameter is to limit the converter peak current and/or to limit the maximum motor voltage (especially for induction machines).<br>Note: this parameter is valid for the default profile and also for Alt1 .. Alt3 profiles. |
| Creep Speed mm/s | **Visible only when "Interface Type" = 1**<br>This is the final landing speed of the profile generator. When the profile hits this speed after it decelerates to the target it travel with a constant velocity of "Creep Speed" for a certain distance defined in "Creep Length". If the "Creep Speed" is set to zero this feature is disabled. |
| Creep Length mm | **Visible only when "Interface Type" = 1**<br>The distance covered between the events that the profile reaches the creep speed and it finally lands to the target. Setting this value to zero disables this feature. |
| Creep Jerk 0/1 | **Visible only when "Interface Type" = 1**<br>This service tool selection provides the choice of ending the creep zone via either a limited jerk profile, where the jerk value is defined in "Jerk mm/s3" or a timed deceleration.<br>0 – Infinite jerk values are used during final landing (i.e., timed decel)<br>1 – Finite jerk values are used during final landing (i.e. profile)<br>Choice "1" results in smoother landing, while choice "0" results in faster landing (shorter flight time). |
| Zero Vel Tim ms | **Visible only when "Interface Type" = 1**<br>This parameter sets the time for holding the velocity reference at zero speed at the end of a run to ensure car motion has stopped before dropping the brake. |
| MCSS Overspeed % | **Visible only when "Interface Type" = 0,2,3,4**<br>Overspeed trip point as a percentage of the parameter: Duty Speed mm/s<br>See fault: 500 Overspeed. |
| MAN Overspeed % | **Visible only when "Interface Type" = 0,2,3,4**<br>Overspeed trip point as a percentage of the parameter: Man Speed mm/s<br>See fault: 500 Overspeed. |
| ARO Overspeed % | **Visible only for Duty Type = 1 and ARO Type = 2 or 5.**<br>Overspeed trip point as a percentage of the parameter: ARO Speed mm/s. 0 disables the overspeed trip. See fault: 533 ARO Overspd. |
| ARO Speed mm/s | **Visible only when "Duty Type" = 1 .**<br>**Visible only when "ARO Type" = 2.**<br>Speed during ARO type run. See related fault: 533 ARO Overspd. |
| ETP Spe %DutySpe | **Visible only when "Interface Type" = 1**<br>The Emergency Terminal Protection (ETP) feature is used at units above 2.5 m/s in case of reduced buffer stroke. This parameter specifies the speed below which the message DriveSpeedCheck2 is sent to the OCSS. The OCSS then operates the ETS1 relay. The unit is percent of the parameter "Duty Speed mm/s". |
| ETP2 Spe %Duty | **Visible only when "Interface Type" = 1**<br>Refer to "ETP Spe %DutySpe" above. This is threshold of "ETP secondary". Drive sends the message of DriveSpeedCheck2(EtpSecondary) to OCSS. |
| ETP delta % | **Visible only when "Interface Type" = 1**<br>Hysteresis for ETP Spe and ETP2 Spe to avoid toggle of the message |

| | |
|---|---|
| Buffer/ETSD mm/s | **Visible only when "Interface Type" = 1**<br>Speed for the Buffer/ETSD test run.<br>Note: this parameter is automatically limited to Duty Speed mm/s and Nom Speed mm/s (whatever is lower). |
| GovOverSpd mm/s | **Visible only when "Interface Type" = 1**<br>Speed for the Governor Overspeed test run.<br>Note: this parameter is automatically limited between 100% x Nom Speed mm/s and 130% x Nom Speed mm/s. |
| Man Load % | **Visible only for Duty Type = 1**<br>This is used when a load weight device is unknown in a case like construction mode. Sets the value as in-car load%. |
| Enc acc lim m/s2 | **Visible only for Duty Type = 1**<br>Specifies the acceleration rate above which the velocity feedback is ignored. This is designed for encoders that occasionally produce noise spikes with acceleration levels that are an unrealistic representation of the mechnnical system. If the acceleration level is ignored, it will be ignored only for as long a the Enc acc lim t ms parameter setting.<br>A typical value to use is 9.8. |
| Enc acc lim t ms | **Visible only for Duty Type = 1**<br>Specifies the maximum amount of time that the velocity feedback will be ignored if the acceleration limit (see Enc acc lim m/s2) is exceeded.<br>A typical value to use is 10. |
| UCM Acc Up mm/s2 | **Visible only when "Interface Type" = 1**<br>Specifies the acceleration rate for the free-roll simulation profile used in the UCM-EN handover test, empty car up. |
| UCM Acc Do mm/s2 | **Visible only when "Interface Type" = 1**<br>Specifies the acceleration rate for the free-roll simulation profile used in the UCM-EN handover test, full load down. |
| Dec Speed mm/s | **Visible only when "Interface Type" = 1.**<br>This parameter specifies the Decreased Speed (or Lower speed) that the car reduces to after passing the 1DS or 2DS sensor. It should be set so that the buffer impact allowance speed is satisfied. See the parameter "TwoStepSpeed 0/1" for more details. |
| TerminalPhase mm | **Visible only when "Interface Type" = 1.**<br>Length of reduced-speed zone before the terminal landing. This specifies a feature that limits speed to the value "TerminalPhs mm/s" within this terminal zone, e.g. where a reduced stroke buffer requires a speed lower than a 2 stage ETSD can handle.<br>Setting this parameter to zero disables the "reduced terminal speed" feature and hides the parameter "TerminalPhs mm/s".<br>Setting this parameter >0 enables the "reduced terminal speed" feature and disables the creep phase specified by "Creep Speed mm/s" and "Creep Length mm" for all target landings within "TerminalPhase mm". |
| TerminalPhs mm/s | **Visible only when "Interface Type" = 1 and "TerminalPhs mm/s" > 0.**<br>Speed limit in reduced-speed zone before the terminal landing. This specifies a feature that limits speed to this value within the terminal zone "TerminalPhase mm", e.g. where a reduced stroke buffer requires a speed lower than a 2 stage ETSD can handle. |

## 6.7.6 3-6 FACTORY

| SVT Display | Description |
|---|---|
| Factory Password | When the correct password is entered, the following parameters become visible to the user. |
| DC Bus fscale V | **Visible only when "Factory Password" is set.**<br>Specifies the full-scale voltage for the DC bus voltage sensing. This parameter is adjusted at the factory so that the DC bus voltage shown in the service tool matches the DC voltage measured using a DVM.<br>**Note for 60A/120A/160A V.2 and 20A/30A/40A V.2.1 and 30A/40A V.2.2 drives**:<br>the trim parameter is stored in the power section EEPROM and is read automatically. This parameter will therefore be set automatically to its default value of 1000 and does not need to be adjusted. |
| AC Line fscale V | **Visible only when "Factory Password" is set.**<br>Specifies the full-scale voltage for the AC line voltage sensing. This parameter is adjusted at the factory so that the AC line voltage shown in the service tool matches the AC voltage measured using a DVM. The average of the sensed voltages should be used for this calibration procedure. For example, the 60A drive has only two line-to-line voltage sensors (Vrs and Vst). These two line-to-line voltages should be averaged for this calibration procedure. It is preferred that the factory has a balanced AC line supply for this procedure, but it not necessary.<br>**Note for 60A/120A/160A V.2 and 20A/30A/40A V.2.1 and 30A/40A V.2.2 drives**:<br>the trim parameter is stored in the power section EEPROM and is read automatically. This parameter will therefore be set automatically to its default value of 1000 and does not need to be adjusted. |
| Ac/Dc Calibra PU | **Applicable only when "Low Volt Op 0/1" is set to 1.**<br>This is the calibration factor that ensures AC voltage sensing and DC voltage sensing are commensurate. |
| Cnv PWM freq Hz | **Visible only when "Factory Password" is set.**<br>Specifies the PWM frequency of the converter. The current regulators run at half the PWM frequency over 5000kHz.<br>OVF460G: 6000Hz<br>OVF428G: 10000Hz with D25 machine<br>OVF428G: 6000Hz with IM40T machine<br>OVF428G: 9000Hz with PM30T or 156MST machine<br>OVF416G: 7000Hz with PM138 or 156MST machine<br>Other drives are 10,000Hz as a default. |
| Inv PWM freq Hz | **Visible only when "Factory Password" is set.**<br>Specifies the PWM frequency of the inverter. The current regulators run at half the PWM frequency over 5000kHz..<br>OVF460G: 6000Hz<br>OVF428G: 5000Hz with D25 machine<br>OVF428G: 6000Hz with IM40T machine<br>OVF428G: 9000Hz with PM30T or 156MST machine<br>OVF416G: 7000Hz with PM138 or 156MST machine<br>Other drives are 10,000Hz as a default. |
| Cnv Hrmnc On 0/1 | **Visible only when "Factory Password" is set.**<br>Specifies if the converter harmonic regulators are active.<br>0 – The converter harmonic regulator is disabled<br>1 – The converter harmonic regulator is enabled.<br>This parameter can be changed while the drive is running.<br>For OVF416G, 428G and 460G, this parameter is normally set to "0" as a disable. |

## 6.8 Engineering Parameters Detailed Description

***Parameters in the engineering SVT menu are meant for engineering purposes only. Please do not arbitrarily change SVT parameters in the engineering menu without consultation from engineering first. Otherwise, damage to equipment is possible.*** The parameters are visible only when the engineering password has been entered.

### 6.8.1 6-1 ENG ADJUST

| SVT Display | Description |
|---|---|
| Engineer Passwrd | When the correct password is entered, the engineering menus become visible to the user. |
| PFC Volt Lvl % | **Visible only when "Engineer Passwrd" is set.** The Power Factor Controller (PFC) is a voltage regulator that allows higher ac input voltages without exceeding maximum sinusoidal converter output voltage and is applicable to regen drives only. This parameter specifies the voltage level at which the PFC begins to dictate positive d-axis current. This parameter is a percentage of the maximum sinusoidal output voltage, which is equal to the bus voltage divided by sqrt(2) (line-to-line rms). This parameter is typically set to 100. To disable the PFC, set this parameter to 200. This parameter is usually useful in NAA area as for other regions the ac input is lower. |
| Min IGBT on t us | **Visible only when "Engineer Passwrd" is set.** Sets an IGBT minimum on–time different from default settings. Note: parameter Engineering Test must be set to 2006 (enable 156inimum IGBT time) prior to this. |
| Pos Gain | **Visible only when "Engineer Passwrd" is set.** Proportional gain of the position regulator. |
| Pos Err Lim mm | **Visible only when "Engineer Passwrd" is set.** Specifies the limit used to detect tracking error. If the absolute difference between the predicted position (based on the profile generator position reference) and the position feedback (based on the encoder) exceeds this limit, a fault is logged and an emergency stop results. See fault: 501 Pos Tracking |
| Vel fscale PU | **Visible only when "Engineer Passwrd" is set.** Per unit value of the internal software scaling of the velocity. |
| LRT Frequency PU | **Visible only when "Engineer Passwrd" is set.** This is the frequency of the test current signal as a per unit of the desired current inverter regulator frequency to calculate rotor magnet postion with respect to the encoder. |
| LRT Ld Cycles | **Visible only when "Engineer Passwrd" is set.** This is the number of periods of the rotor inductance waveform. The rotor inductance waveform repeats itself over a mechanical revolutions by the number of pole pairs. A good number minimum number for this would be the number of pole pairs. Anything larger will improve noise immunity of the results. |
| Vq out thresh PU | **Visible only when "Engineer Passwrd" is set.** Q-axis current regulator output threshold when the brake is not lifted yet. This is used to detect failed current sensors or disconnected motor from the drive as a result of wiring errors or relays not working etc. See fault 111 No Id fdbk. |
| Sngl PWM ang deg | **Visible only when "Engineer Passwrd" is set.** This parameter determines when one of the converter legs (R- or S-phase) not to be switched while the other is being switched. The threshold is as a function of the utility angle (utility voltage signal crossing zero volts is the reference). A value of zero disables the feature all together leaving a sine triangle PWM method, while a very small nonzero value will cause one cycle not to switch and the other switching, while the next cycle this role swaps as far as the phase concerns. |

| | |
|---|---|
| Test Noise Lvl % | **Visible only when "Engineer Passwrd" is set.**<br>This parameter along with "Test Noise BW Hz" control the characteristics of the noise injected to the control loops in special test modes. This parameter multiplies the noise by unity at 100 percent and linearly otherwise. This parameter is especially used to filter the noise heavily for low bandwidth loops while generating enough excitation for acceptable coherence. |
| Test Noise BW Hz | **Visible only when "Engineer Passwrd" is set.**<br>This parameter sets the bandwidth (Hz) of the white noise used during the test modes for the inner and outer velocity regulators, the field weakening regulator, and the position regulator. |
| Target mm | **Visible only when "Engineer Passwrd" is set.**<br>Position target, applicable only in DAT_PROFILE test mode. |
| Drive Pmax kW | **Visible only when "Engineer Passwrd" is set.**<br>This parameter specifies the set point for the power-limiting feature in the profile generator. This is an engineering parameter, normally set to a very high value so that the function is disabled. When it is set to a value close to the drive capability, a near-optimal trajectory is calculated to limit the maximum output power (in the profile generator this controls J4f and J6f). |
| Load in car % | **Visible only when "Engineer Passwrd" is set.**<br>This parameter is used in conjunction with the power-limiting feature of the profile generator (see "Drive Pmax kW" above). This is an engineering parameter used only in the DAT_PROFILE mode. In all other normal modes, the actual load from the load weight system is used. |
| Drive Vrated m/s | **Visible only when "Engineer Passwrd" is set.**<br>This parameter is used in conjunction with the power-limiting feature of the profile generator (see "Drive Pmax kW" above). This value should be larger than or equal to the nominal speed of the elevator. This is useful when a high speed machine is to be used at lower speeds. |
| Belt Cmp Off A | **Visible only when "Engineer Passwrd" is set.**<br>This parameter is used to over-ride the learned compensation parameter for belt and traveling cable imbalance. This parameter specifies half of the difference of the torque current during the constant speed portion of the run near the bottom and near the top of the hoistway. The variation should not exceed 30% of rated motor torque.<br>See display parameter: `BeltCmp:Offset A` |
| Belt CmpSlp mA/m | **Visible only when "Engineer Passwrd" is set.**<br>This parameter is used to over-ride the learned compensation parameter for belt and traveling cable imbalance. This parameter determines how much current variation is observed per meter of hoistway due to belt and traveling cable imbalance. The drive calculates the necessary current needed to add to the pretorque based on the current position in the hoistway.<br>See display parameter: `BeltCmp:Slp mA/m` |
| BeltCmp Lrn? 0/1 | **Visible only when "Engineer Passwrd" is set.**<br>Specifies if the learned parameters to compensate for belt and traveling cable imbalance should be used or over-ridden:<br>0, 2 – over-ride the learned values and use the parameters specified in EEPROM instead (see above)<br>0 : Comp_Rope_weight < Main_Rope_weight or without Compensation Rope "Belt Cmp Off A" >= 0<br>2 : Comp_Rope_weight > Main_Rope_weight "Belt Cmp Off A" < 0<br>1 – use the learned compensation values |

| | |
|---|---|
| 2D Enable? 0/1 | **Visible only when "Engineer Passwrd" is set.**<br>This parameter is used to enable transmission of the CAN message "DriveStoppingInfo", which is sent every 30ms, when enabled. |
| ARO Bus LwrLim V | **Visible only when "Engineer Passwrd" is set.**<br>**Applicable only during ARO(EN) mode.**<br>During ARO with the regenerative drive, no regenerative energy is allowed to return to the battery. Instead, the DC bus is allowed to increase and the regenerative energy is dissipated in the losses. If the regenerative energy exceeds the nominal losses in the drive such the the bus voltage rises above a voltage threshold, then d-axis current is increased in the motor in order to increases the losses in the motor, thereby limiting the DC bus voltage rise. This parameter specifies the voltage limit on the DC bus, and the parameter ARO Mot Id PU specifies how much d-axis current is to be commanded if the bus voltage were to reach 750 Vdc (thereby setting the gain of the control). |
| ARO Mot Id PU | **Visible only when "Engineer Passwrd" is set.**<br>**Applicable only during ARO(EN) mode.**<br>Used in conjunction with the parameter ARO Bus LwrLim V above. |
| Max Bat Chrg I A | **Visible only when "Engineer Passwrd" is set.**<br>**Applicable only during ARO(EN) mode.**<br>This parameter specifies the amount of regenerative (charging) current during ARO operation. It is nominally set to zero. When it is set to zero, if the drive detects current less than zero, the fault 211 Battry Chrgd will be logged and the drive will ESTOP. When it is set greater than zero, then regenerative (charging) current is allowed up to the value specified. |
| Brk I Hold A | **Visible only when "Engineer Passwrd" is set.**<br>**Applicable only when using internal brake (Int Brk Type 0-4 = 1).**<br>This specifies the acceptable brake pick and drop thresholds for the brake current feedback when using the internal brake control. The faults that will be logged are: 405 Brake I Drop and 406 Brake I Hold. |
| Brk I Max A | **Visible only when "Engineer Passwrd" is set.**<br>**Applicable only when using internal brake (Int Brk Type 0-4 = 1).**<br>This specifies the maximum brake current feedback when using the internal brake control. The fault that will be logged is 407 Brake I Max. |
| Brk I Offset A | **Visible only when "Engineer Passwrd" is set.**<br>**Applicable only when using internal brake (Int Brk Type 0-4 = 1).**<br>Specifies the allowable offset current when using the internal brake. If the threshold is exceeded, the fault that is logged is 404 Brake I Off. |
| SVT Timeout min | **Visible only when "Engineer Passwrd" is set.**<br>When a remote (MCSS pass-through) SVT is connected and no local SVT is connected, the remote SVT gets direct access. However, if a local SVT has been connected for less than the amount of time specified by this parameter, then remote access is not automatically granted. Instead, a prompt is sent to the remote SVT warning that a local SVT is connected. The prompt allows for the local SVT to be manually overridden. The default for the timer is 4 hours. |
| Pre Chg Lim sec | **Visible only when "Engineer Passwrd" is set.**<br>This parameter is applicable only for the following drives: 90A, 120A, 428, 460, and LCRD w/o eI2C capabilities. The parameter specifies the maximum time the drive is allowed to try to precharge the DC bus. The default value is 10 seconds.<br><br>For all other drives this parameter is **not** applicable. The precharge is fixed to a pre-set amount and is not adjustable. The specific times are:<br>• 3.96 seconds for 25A, 40A drives and LCRD w/ eI2C capabilities.<br>• 6.96 seconds for 60A drive.<br>• 2.20 seconds for 60A-CR drive. |

| | |
|---|---|
| Rollback Call mm | **Visible only when "Engineer Passwrd" is set.**<br>This parameter is valid for JIS and CAN system.<br>The drive checks if the rollback distance is over this setting. |
| Inv ReLe Ilimit% | **Visible only when "JIS Function 0/1" = 1 and "Engineer Passwrd" is set.**<br>You can check this setting by F12 " I% IA IR% IRA " of SVT monitor.<br>Specifies the current limit of Re-level for the inverter as a percentage of the full scale current for the drive. This also determines the overcurrent trip level, which is set at 105% of the current limit of Re-level.<br>See fault: 100 Inv SW Oct |
| Vel Inr wc rad/s | This is the velocity loop crossover frequency. Typical values are from 2 to 4. The default value is 2. |
| Torq Obs Err % | **Visible only when "Engineer Passwrd" is set.**<br>This parameter sets the threshold for the fault: 544 Torq Obs Flt.<br>The torque obsever error is the difference between measured motor torque and expected motor torque (predicted based on motion commands).<br>The fault indicates that the atual troque feedback diverged from the expected torque and may indicate there is an obstruction in the hoistway or that belts/ropes friction is less than expected. Setting this parameter to 0 disables this fault.<br>0: Fault is disabled.<br>>0: fault is enabled and the threshold is set to the parameter value. |

## 6.8.2 6-2 ENG TEST

***Parameters in the engineering SVT menu are meant for engineering purposes only. Please do not arbitrarily change SVT parameters in the engineering menu without consultation from engineering first. Otherwise, damage to equipment is possible***. The parameters are visible only when the engineering password has been entered.

| SVT Display | Description |
|---|---|
| Engineer Passwrd | When the correct password is entered, the remaining engineering menus become visible in the service tool. |
| Engineering Test | **Visible only when "Engineer Passwrd" is set.**<br>Used to activate one of several tests used by engineering. The test are listed in the table below. |

| Test | Description |
|---|---|
| 10…99 | Individual sets of variables are monitored via Test Vars (M18). |
| 100 | Set ICD version manually, ep1:= ICD version |
| 101 | Monitor pos fbk shift in test vars, IF (ep4==1234 AND ep5==1234): trigger one-time EndRun cmd injection at (22000mm-ep1/10) |
| 102 | Determine LS lag :<br>A) IF (ep5==2345 AND ep1>0): invalidate current floor (and NCF and TgtFloor) ep1 ms after entering IDLE -> cycles system in CORR runs.<br>B) In CORR runs : Monitor first fbk correction after LS recovery:<br>TestVariable1=max corr in up dir, TestVar2: min corr in up dir,<br>TestVariable3=max corr in down dir, TestVar4: min corr in down dir.<br>C) Outside CORR runs : Monitor corrections at vanes:<br>TestVariable1=max magnitude correction, any dir,<br>TestVariable2: sum of corrections in UP runs, |

| | |
|---|---|
| | TestVariable3: sum of corrections in DOWN runs,<br>TestVariable4: num of corrections monitored (both dir).<br>Note: Negative correction = Pos.fbk step upwards. |
| 103 | Inject UIS DIS: Sets the UIS or DIS signal in s/w to simulate a PRS transition. It is used to cause a position correction with specific timing. Details: See description in code. |
| 104 | Inject vane state after LS: This test sets the PRS signals in s/w to simulate a PRS transition causing a position correction. The timing of this transition is preset to a chosen delay after Floor.current changed from INVALID to valid, e.g. after an LS transition. After setting and holding HwySignals, the test's intrusion is ended when<br>- The PRS input reaches the state preset by s/w, or<br>- 5s have expired<br>Parameters and outputs: See source code. |
| 105 | Emulate hysteresis and latency in PRS: This test delays PRS signal transitions to introduce latency or/and modifies mm-position captured at PRS transitions to introduce additional hysteresis. The purpose of the test is to verify process identification tools and to simulate effects of low-quality PRS's. The hysteresis and latency can be specified for each sensor (UIS, 1LV, 2LV, DIS) individually.<br>Parameters and outputs: See source code. |
| 106 | Set speed thresholds for switch to High Speed Vane Tracking:<br>ep1 = lower threshold in mm/s (HSVT -> full tracking)<br>ep2 = higher threshold in mm/s (full tracking -> HSVT) |
| 107 | ENGTEST_EMULATE_RLEV_SIG_SEQUENCE<br>This test emulates UIS/DIS during an ongoing RELEVEL run such that two UIS/DIS transitions are injected after the run has entered the NRZ. This test provides reduced functionality of test 108.<br>Parameters and outputs: See source code. |
| 108 | This test emulates UIS/DIS during an ongoing RELEVEL run such that two UIS/DIS transitions are injected after the run has entered the NRZ.<br>Parameters and outputs: See source code. |
| 109 | ENGTEST_ESTOP_SLIDE1 |
| 110 | ENGTEST_ESTOP_SLIDE2 |
| 111 | Single phase test. When this value is set the drive configures the test variables to send the following variables:<br>Test Frac 1 = Converter x phase voltage before Single phase PWM forced.<br>Test Frac 2 = Converter y phase voltage before Single phase PWM forced.<br>Test Frac 3 = Sin of converter phase angle;<br>Test Frac 4 = Sin of the converter phase angle at which single phase PWM is invoked |
| 112 | ENGTEST_TRIGGER_FAULT |
| 113 | ENGTEST_DELAY_PRS_AFTER_10MS_LATCH |
| 121 | ENGTEST_DYNE_CYCLE_NO_STOPFAULTS: Disables "520 Rllbck Start", "521 Rllbck Stop" and "506 Stopping Err". Will remain active in background if Engineering Test is set to other non-zero value. Is deactivated for Engineering Test = 0 (no test). |
| 122 | ENGTEST_DISABLE_FAST_LW_AT_RLEV |
| 132 | ENGTEST_TORQUE_BOOST_GAIN |
| 136 | ENGTEST_BELT_SLIP |
| 138 | ENGTEST_LVL_HEALTH |
| 200 | ADC_FILTER |
| 400 | Test mode where both inverter and converter are disabled |
| 401 | Test mode where the converter control is disabled and the inverter is enabled. Second digit refers to converter and third refers to inverter |
| 410 | Test mode where converter is enabled but inverter disabled |
| 420 | ENGTEST_UPS |
| 463 | makes landing table invalid (once per setting) |
| 464 | ENGTEST_INVALIDATE_FLOOR_CURRENT |

| | |
|---|---|
| | Floor.current is set to “FLOORNUM_INVALID”. |
| 465 | ENGTEST_INVALIDATE_LDGTABLE_IN_E2P |
| 470 | Setting this test triggers (once) position recovery from SPBC/GECB, monitored in test vars M18. |
| 482 | Not used (was applicable only for non-regen drives). |
| 497 | manipulates detected pos and floor at transition into 1LS<br>IF (ep1!=0 or ep2!=0): detctdPos := learnedPos+ep1-ep2<br>IF (ep3!=0 or ep4!=0): curFlr := learnedFlr+ep3-ep4 |
| 498 | ENGTEST_2LS_FLASH_WHEN_1LS_ON |
| 499 | ENGTEST_2LS_ON_WHEN_1LS_ON |
| 500 | ENGTEST_1LS2LS_ON_WHEN_2LS_OFF |
| 512 | PRS Override |
| 513 | lower speed check limit for releveling, triggers RLEV abort |
| 600 | ”BrakeState” CAN message is derived from BY relay instead of BS1/2 |
| 601 | Simulates different states of BS1 and BS2 inputs. Affects only the ”BrakeState” CAN message, not drive operation. |
| 610 | Check the communication between GDCB and SBSB using DAT:<br>Test Int 1: Command to SBSB:<br>1: 20% duty cycle: No diode to both brake coils, 20V hold voltage<br>2: 40% duty cycle: One brake coil with diode and 46V,<br>other brake coil no diode and 20V<br>3: 60% duty cycle: Both diodes to both brake coils, 46 V<br>4: 80% duty cycle: No diode to both brake coils, 46V pick voltage<br>Test Int 2 **=** Answer from SBSB, identical to command expected<br>Test Int 3 **=** 10 releases "932 SBSB Fault "<br>Test Int 4 **=** Torque value for "SBSB Motor Trq %" and "SBSB Regen [+49%" |
| 766 | Monitor internal learn run vars in test.xy display vars. |
| 800 | JIS DEFAULT PARAM<br>This should be set after the end of a test of “801 JIS UCMP TEST” to return to default parameters. |
| 801 | JIS UCMP TEST<br>This is used for UCMP test. If "EngTest Param1" is set from 0 to 180, the pole position is shifted to start with an un-intended motion which is called “Rocket start”. |
| 802 | JIS TRACKING INVALID<br>This is used for any engineering test without “velocity tracking fault”. |
| 803 | JIS WITHOUT LWS<br>This is used for CAN simulator without LWS. If this is set, a releveling mode is enabling with invalid data of the Load. |
| 804 | ENGTEST_JIS_REI_BTI<br>This is used for Brake inspection mode of Remote test.<br>If "EngTest Param1" is set to 2, Drive sends NG_DATA by 2 trying to OCSS. |
| 805 | ENGTEST_JIS_DBR_TEST<br>This is available to set the DBR status to ON or OFF. |
| 833 | ENGTEST_CAN_OVERSPEED<br>This mode is used for “115% Overspeed running” with CAN Interface.<br>If this mode is set, the Overspeed threshold is changed from 110% to 120%. |
| 841 | ENGTEST_LRT_24H_TEST<br>This test mode is for LRT quality during 24 hours cycle run.<br>Every running does the LRT before start of the run. |
| 851 | ENGTEST_ETSD_MODE<br>This is used for NTSD and ETSD test of HSOVF or OVF412RCR with CAN interface.<br>NTSD: If the "EngTest Param1" is set to 120%, the "Decel mm/s2" is 120% for the profile.<br>ETSD: If the "EngTest Param2" is set to 100, the NTSD mode is disabled. |

| | |
|---|---|
| 852 | ENGTEST_POWER_DOWN_MODE<br>This is used for a test of “Power down” with MX-OFF.<br>If the "EngTest Param1" is set to 100, the “Drive.dischargeRequest" is set to TRUE.<br>Then Drive state moves to “Power Down” with MX-OFF. |
| 853 | ENGTEST_SLACK_ROPE<br>This is used for check of “728 Slack Rope" event. |
| 854 | ENGTEST_TCI_ERO_MODE<br>This is used for the test of TCI operation in LS with ERO. |
| 855 | ENGTEST_MCSS_NTSD_TEST<br>This is used for drive limit control during NTSD |
| 861 | ENGTEST_LW_HITCH_CHECK<br>If the "EngTest Param1" is set to some LwHitchSensorNumber,<br>The data of "HitchLwSensor" is able to be monitored on SVT M213. |
| 862 | ENGTEST_BALLANCE_CHECK<br>Only for an engineering test to SVT monitor "Unbalance %  kg".<br>The "EngTest Param1" is applied to unbalanced Iq. |
| 863 | ENGTEST_LW_DATA_CHECK<br>The hitch load data is visible on SVT or DAT monitor.<br>Test.x1 = LwLoadPercent;<br>Test.x2 = LwHitchKg;<br>Test.x3 = LwHitchSensorNumber;<br>Test.x4 = LwHitchSensorValue; |
| 871 | ENGTEST_RELEVEL_TEST<br>The PRS data is visible on SVT or DAT monitor.<br>Test.x1 = In.uis;<br>Test.x2 = In.dis; |
| 872 | ENGTEST_BRAKE_OPEN_TEST<br>Only for an engineering test to verify the “Brake Open mode”.<br>BrkTrqTest.brkOpenSpeedthreshMLB = _IQ( E2_value[E2_ENG_TESTPARAM1] / Vel.fs_mmps);<br>BrkTrqTest.brkOpenSpeedthreshGap = _IQ( E2_value[E2_ENG_TESTPARAM2] / Vel.fs_mmps); |
| 890 | ENGTEST_MOTOR_SLIP_TEST<br>This is used for check of “030 MotorRun Err” event. |
| 900 - 929 | Self Commisioning fault management tests. Each test simulates one of the self commissioning faults. |
| 930 | ENGTEST_ADVANCED_STOPPING_DISTANCE |
| 931 | ENGTEST_MM_POSITION |
| 932 | OARO STATE MACHINE |
| 933 | ENGTEST_OARO_CHARGER_POWER |
| 934 | ENGTEST_OARO_BATTERY_FAULT |
| 935 | ENGTEST_OARO_OVER_TEMP |
| 937 | ENGTEST_OARO_TYPE_MIS |
| 938 | ENGTEST_OARO_DISCHARGED_BATTERY |
| 939 | ENGTEST_OARO_FAULT |
| 940 | ENGTEST_OARO_BLV_RELAY |
| 941 | ENGTEST_OARO_AR_RELAY_PICK |
| 942 | ENGTEST_OARO_AR_RELAY_DROP |
| 943 | Reserved for Ultra Drive platform |
| 944 | ENGTEST_AHC_DYNE_RESONANCE<br>Allows for white noise transfer function of dyne resonance filter for AHC |
| 945 | ENGTEST_AHC_NOTCH_FILTER<br>Allows for white noise transfer function of notch filter for AHC |
| 946 | ENGTEST_VEL_SIN<br>Allows for sine wave injected into velocity command test mode for system transfer function |

| | |
|---|---|
| 947 | reserved for MCSS communication test in Top of car software |
| 1000 | Vdc cap failure test. When setting the engineering parameter to this value it generates a dc cap failure fault, even it is not happened. |
| 1502 | This is to indicate the software the drive hardware is configured for ARO test mode where the dc bus is regulated to 150volts (regen drive only) with the exception that if “EngTest Param1” is set greater than 99 volts, then the bus voltage reference will be whatever “EngTest Param1” is set to. |
| 1503 | Makes profile delay setting effective during ARO. Captures selectable sets of variables related to ARO roll and converter current threshold detection in the Test.x DAT variables, see source code for details.<br>This test is automatically activated after POR by the one-shot parameter set E2_ENG_TESTPARAM1:= 20, PARAM2:= 6, PARAM3:= 64. |
| 1504 | UCM_FAULT |
| 1505 | ARO_BOOST2: This engineering test mode enables the global regenerative drive to be run from batteries while the battery is connected on L1 –L3 and also it allows the Korean Regen drives to operate on battery dc bus voltage boosting mode. The Korean Regen drive requires the batteries being connected on L1-L3 of the input phase. Note also that the global REGEN drive needs an external precharge circuitry, otherwise damage could occur. |
| 1900 | OARO_BATTERY_TEST |
| 1901 | OARO_BATTERY_TEST2 |
| 2000 | Fan test (fan is on with specified duty cycle). The duty cycle is commanded via the the engineering menu and setting parameter EngTest Param1. |
| 2001 | Position Filter Test. Sets the following test varaibales for visibility:<br>Test.x1 = Pos.correction;<br>Test.x2 = wholeUnits;<br>Test.x3 = incrementalCorrection; |
| 2002 | Profile test 1. Sets test variables as follows:<br>Test.x1 = _IQ((Prof.pos+Prof.sd)/100.0);<br>Test.x2 = _IQ(nextStoppingPosition/100.0);<br>Test.x3 = _IQ(advProfStatePtr->dataInvalid_decelPhase);<br>Test.x4 = _IQ(advProfStatePtr->acc); |
| 2003 | Profile test 2. Sets test variables as follows:<br>Test.x1 = Pos.latch + Pos.direction * ProfStateIn350ms.pos;<br>Test.x2 = nextStoppingPos;<br>Test.x3 = nextStoppingPosIn350ms;<br>Test.x4 = ProfStateIn350ms.dataInvalid_decelPhase; |
| 2004 | Start delay test. Sets test variables as follows:<br>Test.x1 = possibleStartDelayMs; |
| 2005 | Temperature test. Sets temperature reading based on DAT:<br>Inv.temp.in = _IQ(((OInt32)(Pc_to_logger.ref_0 + Pc_to_logger.ref_1)) / HEATSINK_FULLSCALE); |
| 2006 | Enables minimum IGBT on-time for regen drive also and allows minimum on-time to be set according to the SVT parameter “Min IGBT on t us” for both types of drives. |
| 4001 | PLL test in which the converter and the inverter is disabled. This test mode works in conjunction with the DAT to get signal values from the DAT. See Table 8-2 Test Mode I/O. |
| 8010 | ZERO_OUT_LOAD_WEIGHING: This test mode independently disables the pretorque value and sets it to balanced car (load) condition (=0). |
| 9010 | Simulates failed 1LS signal in low state |
| 9011 | Simulates failed 1LS signal in high state |
| 9020 | Simulates failed 2LS signal in low state |
| 9021 | Simulates failed 2LS signal in high state. in high state |
| 9022 | ENGTEST_ZKIP - Returns the access level in Test.x1. |

| | |
|---|---|
| 9422 | ENGTEST_ALWA_422 - Enable ALWA algorithm in 422 mode |
| 9431 | ENGTEST_ALWA_ALL - Enable ALWA for all run types. |
| 9432 | ENGTEST_STATE_MACHINE_UIB |
| 9434 | ENGTEST_ADC_BLOCKING_INT |
| 9435 | ENGTEST_422_OVER_CAN |
| 9500 | ENGTEST_SINGLE_PH_HARMONIC_REG |
| 9501 | ENGTEST_INVERTER_HARMONIC_REG |
| 9502 | ENGTEST_INVERTER_HARMONIC_REG_D |
| 9503 | ENGTEST_INVERTER_HARMONIC_REG_Q |
| 9504 | ENGTEST_VBUS_SIMULATED |
| 9505 | ENGTEST_CNV_I_IMBAL |
| 9506 | ENGTEST_ABS_ENCODER |
| 9514 | ENGTEST_MAX_MTR_FREQ150 |

*Note: "ep" = "EngTest Param"*

| | |
|---|---|
| `EngTest Param1`<br>`EngTest Param2`<br>`EngTest Param3`<br>`EngTest Param4`<br>`EngTest Param5`<br>`EngTest Param F1`<br>`EngTest Param F2`<br>`EngTest Param F3`<br>`EngTest Param F4`<br>`EngTest Param F5` | **Visible only when "Engineer Passwrd" is set.**<br>These parameters are MULTI PURPOSE test parameters that have different purposes depending on what test was selected via the "Engineering Test" parameter. |
| `Cnv PWM Avg 0/1` | **Visible only when "Engineer Passwrd" is set.**<br>Specifies if the converter PWM is to be averaged.<br>0 – The converter PWM averaging is disabled.<br>1 – The converter PWM averaging is enabled.<br>This only affects PWM update rate, it does not change the cnv current regulator rate. |
| `Inv HrmncCmp Deg` | **Visible only when "Engineer Passwrd" is set.**<br>This parameter is used to tune the 6th harmonic inverter current regulator stability and to account for computational delays. This heavily depends on the rated frequency of the machine to have harmonic regulators turned on. |
| `Inv Hrmnc BW Hz` | **Visible only when "Engineer Passwrd" is set.**<br>This is the default BW of the 6th harmonic inverter current regulator and potentially needs to be revisited if a new machine is to be tune. |
| `Inv Hr Thrs mm/s` | **Visible only when "Engineer Passwrd" is set.**<br>The 6th harmonic inverter current regulator ideally needs to be tuned based on speed. If not, it is better to turn it on beyond a speed. This parameter defines that threshold. However there is a range of tolerable speeds that the harmonic regulator is supposed deliver stable harmonic current control. |
| `TimeDec Test 0/1` | **Visible only when "Engineer Passwrd" is set.**<br>This parameter allows the user to initiate a timed-decel during a run and is used for test purposes only.<br>0 – no action taken<br>1 - Initiate timed-decel. |

| | |
|---|---|
| Encoder Test 0/1 | **Visible only when "Engineer Passwrd" is set.**<br>This parameter allows the user to virtually disconnect the encoder from the control and is used for test purposes only.<br>0 – normal operation<br>1 - the velocity feedback and the position feedback are not used in the velocity regulator, the position regulator, nor the field orientation. The velocity feedback calculation and the position feedback calculation can still be viewed in the service tool display. |
| Ovrtmp Estop 0/1 | **Visible only when "Engineer Passwrd" is set.**<br>Determines how the drive will respond to a heatsink overtemperature fault.<br>0 – The drive will log the fault 601 Inv Tmp Over using the default temperature trip point, and the fault response is to complete the run (COMP).<br>1 – The drive will log the fault 601 Inv Tmp Over using the temperature trip point specified by the parameter HS Overtmp deg C, and the fault response is an emergency stop (ESTOP). |
| HS Overtmp deg C | **Visible only when "Engineer Passwrd" is set.**<br>Specifies the trip point for the overtemperature fault when the parameter Ovrtmp Estop 0/1 is set to 1. |
| Flr To Test | **Visible only when "Engineer Passwrd" is set.**<br>Used only for testing vane positions. Specifies the floor to be tested (bottom floor = 0) |
| Flr Pos mm | **Visible only when "Engineer Passwrd" is set.**<br>Used only for testing vane positions. Displays the center position of vane at the specified floor (previous parameter) |
| Flr New Pos mm | **Visible only when "Engineer Passwrd" is set.**<br>Used only for testing vane positions. Allows the center position of vane at the specified floor to be changed. Normally displays 0, and resets to 0 after change occurs. |
| Flr Vane Len mm | **Visible only when "Engineer Passwrd" is set.**<br>Used only for testing vane positions. Displays the learned length of the vane at the specified floor. Top and bottom vanes are not learned. |
| ALWA Confg 0/1/2 | **Visible only when" Interface type" = 1**<br>0 – Doesnot update pretorque using ALWA gain and offset.<br>1 – Update pretorque using ALWA gain and offset.<br>2 –Reset ALWA algorithm. |
| ARO FLAG AR-Rly | **Visible only when "Engineer Passwrd" is set.**<br>**Applicable only to Optimized ARO when "Interface Type" = 3.**<br>Indicates the status of the BLV/AR fault management for Oprimized ARO.<br>0 = No fault<br>1 = First attempt to pick BLV resulted in AR relay fault<br>2 = Second attempt to pick BLV resulted in AR relay fault<br>This parameter defaults to zero, if it is stored to be nonzero during a power up sequence, then optimized ARO is blocked. This parameter is used in the software to report ARO blockage. |
| ARO FLAG BLV-Rly | **Visible only when "Engineer Passwrd" is set.**<br>**Applicable only to Optimized ARO when "Interface Type" = 3.**<br>This parameter defaults to zero, if it is stored to be nonzero after an optimized ARO sequence, then this parameter is used as an indicator to report the controller that the BLV relay is welded and needs to be serviced. |

| | |
|---|---|
| ARO Faults | **Visible only when "Engineer Passwrd" is set.**<br>**Applicable to NSAA ARU only.**<br>Used as a mailbox for saving ARU fault status for when power returns.<br>#define OARO_FAULTS_NONE 0<br>#define OARO_FAULTS_START 1<br>#define OARO_FAULTS_MISSING_BATTERY 2<br>#define OARO_FAULTS_TYPE_MIS 3<br>#define OARO_FAULTS_DISCHARGED_BATTERY 4<br>#define OARO_FAULTS_FAULT 5<br>#define OARO_FAULTS_PASS 6 |
| ARO Alarm | **Visible only when "Engineer Passwrd" is set.**<br>**Applicable to NSAA ARU only.**<br>If an ARU alarm condition exists, it is set true, false otherwise. |
| UCM-EN BlkLatchd | **Visible only when "Engineer Passwrd" is set. Applicable only when "Interface Type" = 1.**<br>Shows if blockage due to UCM Fault or Brake Monitoring fault is latched in non-volatile memory.<br>0 = no blockage active<br>1 = blockage active, caused by 723 UCM in Run<br>2 = blockage active, caused by 724 UCM in Slide<br>3 = blockage active, caused by 725 UCM BrkBlock |
| DDP Fault | **Visible only when "Engineer Passwrd" is set.**<br>Indicates if a DDP fault is active or not.<br>0 – DDP fault not active<br>1 – DDP fault active<br>This parameter is used to remember the state of the DDP fault through a power cycle. |
| FAN off/0 on/1 | **Visible only when "Engineer Passwrd" is set.**<br>**Applicable only when drive type is 428 and 460 drives**<br>0 = fan is off<br>1 = fan is on |
| Fan Random Area | **Visible only when "Engineer Passwrd" is set.**<br>Changes the carrier frequency of the fan. At the time of Random Area = 0, it is usual control.<br>As for Gen2P&B, the standard is Random Area=10. |
| Temp Over Test | **Visible only when "Engineer Passwrd" is set.**<br>This is only for Over temperature test. This increases the temperature of Converter monitor data.<br>This value is set "0" in Initialize. |
| Can Enc umm/cnt | The drive subscribes to the CAN message ReceivedEncoderData sent from the Safety Sub-System. The data is avaialble in the DAT when engineering test mode ENGTEST_ABS_ENCODER is set. The data can be used for system troubleshooting such as rope stretch. This parameter allows the scaling in micrometers per encoder count to be defined. |
| SSM Config | **Visible only when "Engineer Passwrd" is set and Interface Type = 1.**<br>Static (Belt) Slip Mitigation feature config key and activation status. |
| SSM PhantRPeriod | **Visible only when "Engineer Passwrd" is set and Interface Type = 1.**<br>Latches currrent slip reaction status: Blockage and/or phantom run interval. |
| SSM MaxSlip | **Visible only when "Engineer Passwrd" is set and Interface Type = 1.**<br>Static Slip Mitigation: Latches largest absolute deviation (expected-measured) exit pos. |

| | |
|---|---|
| SSM MaxSlip2 | **Visible only when "Engineer Passwrd" is set and Interface Type = 1.**<br>Static Slip Mitigation: Latches largest deviation beyond margin (if magn>margin) or closest to (if magn<margin). |
| SSM MaxSlip3 | **Visible only when "Engineer Passwrd" is set and Interface Type = 1.**<br>Static Slip Mitigation: Latches largest slip rate or next largest deviation vs. margin. |
| VTE LdRatio Hyst | **Visible only when "Engineer Passwrd" is set and Interface Type = 1.**<br>Vane Transition Estimator: Parameters for ratio EmptyCar vs. DutyLoad and for PRS hysteresis. |
| VTE Hitch Strtch | **Visible only when "Engineer Passwrd" is set and Interface Type = 1.**<br>Vane Transition Estimator: Parameters for hitch spring compression and for rope stretch. |
| VTE MaxErrSameEg | **Visible only when "Engineer Passwrd" is set and Interface Type = 1.**<br>Vane Transition Estimator: Latches max. estimator errors for entry+exit on same edge. |
| VTE MaxErrOtherE | **Visible only when "Engineer Passwrd" is set and Interface Type = 1.**<br>Vane Transition Estimator: Latches max. estimator errors for entry+exit on opposite edge. |
| VTE MaxDevFrmNom | **Visible only when "Engineer Passwrd" is set and Interface Type = 1.**<br>Vane Transition Estimator: Latches max. deviation from nominal exit point and corresponding residual error of estimator. |

### 6.8.3 6-3 DAC

| SVT Display | Description |
|---|---|
| Engineer Passwrd | When the correct password is entered, the remaining engineering menus become visible in the service tool. |
| DAC 1 Signal<br>DAC 2 Signal<br>DAC 3 Signal<br>DAC 4 Signal<br>DAC 5 Signal<br>DAC 6 Signal | **Visible only when "Engineer Passwrd" is set.**<br>Specifies which signal to use on the indicated D/A converter. These parameters are applicable only when the DAT is inactive. |
| DAC 1 Gain<br>DAC 2 Gain<br>DAC 3 Gain<br>DAC 4 Gain<br>DAC 5 Gain<br>DAC 6 Gain | **Visible only when "Engineer Passwrd" is set.**<br>Specifies the gain to be used on the indicated D/A converter. These parameters are applicable only when the DAT is inactive. |
| LvlAccThresholds | **Visible only when "Engineer Passwrd" is set.**<br>This parameters specifies the thresholds for the levelling accuracy health metrics. |

### 6.8.4 6-4 I2C EEPROM

| SVT Display | Description |
|---|---|
| Factory Password | When the correct password is entered, the remaining menus become visible in the service tool. |
| I2CEE Val@2.0000 | **Visible only when "Factory Password" is set.**<br>Displays or modifies value stored in I2C EEPROM with device address 2 and specified subaddress 0000 (example). See description below. |

| | |
|---|---|
| I2CEE Val@3.0000 | **Visible only when "Factory Password" is set.**<br>Displays or modifies value stored in I2C EEPROM with device address 3 and specified subaddress 0000 (example). See description below. |
| I2CEE Val@4.0000 | **Visible only when "Factory Password" is set.**<br>Displays or modifies value stored in I2C EEPROM with device address 4 and specified subaddress 0000 (example). See description below. |

**Description:**
For every available I2C EEPROM device one menu entry is available. Every menu entry consists of 2 switchable modes:

- **Data mode** (default):

```
I2CEE Val@4.0010
  15000>   XXXXX
```

  - The value of I2C EEPROM device 4 at subaddress 0x0010 (example) is displayed and can be modified like any other setup parameter.
    Display format is: decimal unsigned integer. Value range is: [0..65535].
    A negative value -x must be entered in the format: 65536 - |x|.
    Example: to obtain -2 enter 65534.
  - A row of "*******" is displayed instead of the data value when the device is not readable.
  - Press UP or DOWN to increment or decrement the current selected subaddress.
  - Press ON to switch to address mode.

- **Address mode** (entered when ON key has been pressed):

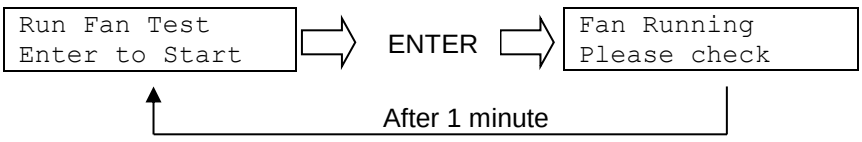
```
I2CEE Adr 4._____
   0010>    XXXX
```

  - The selected subaddress for device 4 (example) is displayed and can be modified like any other setup parameter.
    Display format is: hexadecimal. Value range: [0..1FFE], EVEN values only.
  - Press numeric keys and hexadecimal keys ('A ..'F') to enter a new address value.
  - Press ENTER to accept the new address and switch back to data mode.
    Note that the entered address will be adjusted automatically to an EVEN value.
  - Press OFF to abort address mode immediately and switch back to data mode.

## 6.9 Test Menu Detailed Description

### 6.9.1 5-1 FAN TEST

When this test is activated, the fan should run with full speed for one minute.
The FAN test display sequence after entering **menu 5-1** is shown below:



### 6.9.2 5-2 TURNOVR TST

When this test is activated, some functions are temporarily disabled or modified for several elevator runs:

- The check for proper brake switch state is disabled for 3 runs to allow the single-brake-shoe test. The braking distance is estimated by the drive and displayed by the parameter `Braking Dist mm`.
- The response to a velocity-tracking fault is delayed to accommodate the testing of the safeties. The default delay time is 1.0 second. When `Interface Type` is set to MCSS-type controller, the time can be adjusted using parameter `Turnovr Delay ms`.
- The encoder-timeout fault check is temporarily disabled. This extends the usability of this test mode especially when the motor sheave is blocked (sticky brake; probably pullout of safeties).
- The speed when entering the door zone can be monitored by the service tool display parameter `Vel Entering DZ`.

The SVT display sequence after entering menu 5-2 is shown below:

First a warning message will be displayed:

```
No passengers in
car? Press ENTER
```

<ENTER>

Press ENTER to enable turnover tests for the next 3 runs:

```
Turnover Tst OFF
ON: Press ENTER
```

<ENTER>

Indicates that the turnover test has been enabled for the next 3 runs. The remaining number of runs in this mode are displayed:

```
Turnover Test ON
3 run(s) remain.
```

<After 3 Runs>

Indicates that the 3 runs with turnover test enabled have expired. Press GOON to proceed (e.g. to start this test again):

```
Turnover Test
Complete       >
```

<GOON>

Notes:

- It is possible to leave this service tool menu without canceling this test. To abort the test, press the CLEAR button. A test-aborted message will be displayed. Press GOON to proceed (e.g. to start this test again).
- This test is NOT intended for buffer testing (i.e. 1LS is NOT disabled for any run). For buffer testing please use 6.9.7 "5-6 BUFFER/ETSD" instead.
- A failure during the locked-rotor test (e.g. "503 LRT Motion" during single-brake-shoe test) does not decrement the 3-run counter. This allows easier continuation of this test.
- When the UCM feature is enabled (parameter `UCM-EN on/off` = 1) and the "One-shoe brake test" has been performed on a machine with physical brake switches then a possible UCM blockage must be cleared after restoring the brake (by performing an ERO run).

### 6.9.3 5-3 BrakeTRQ TST

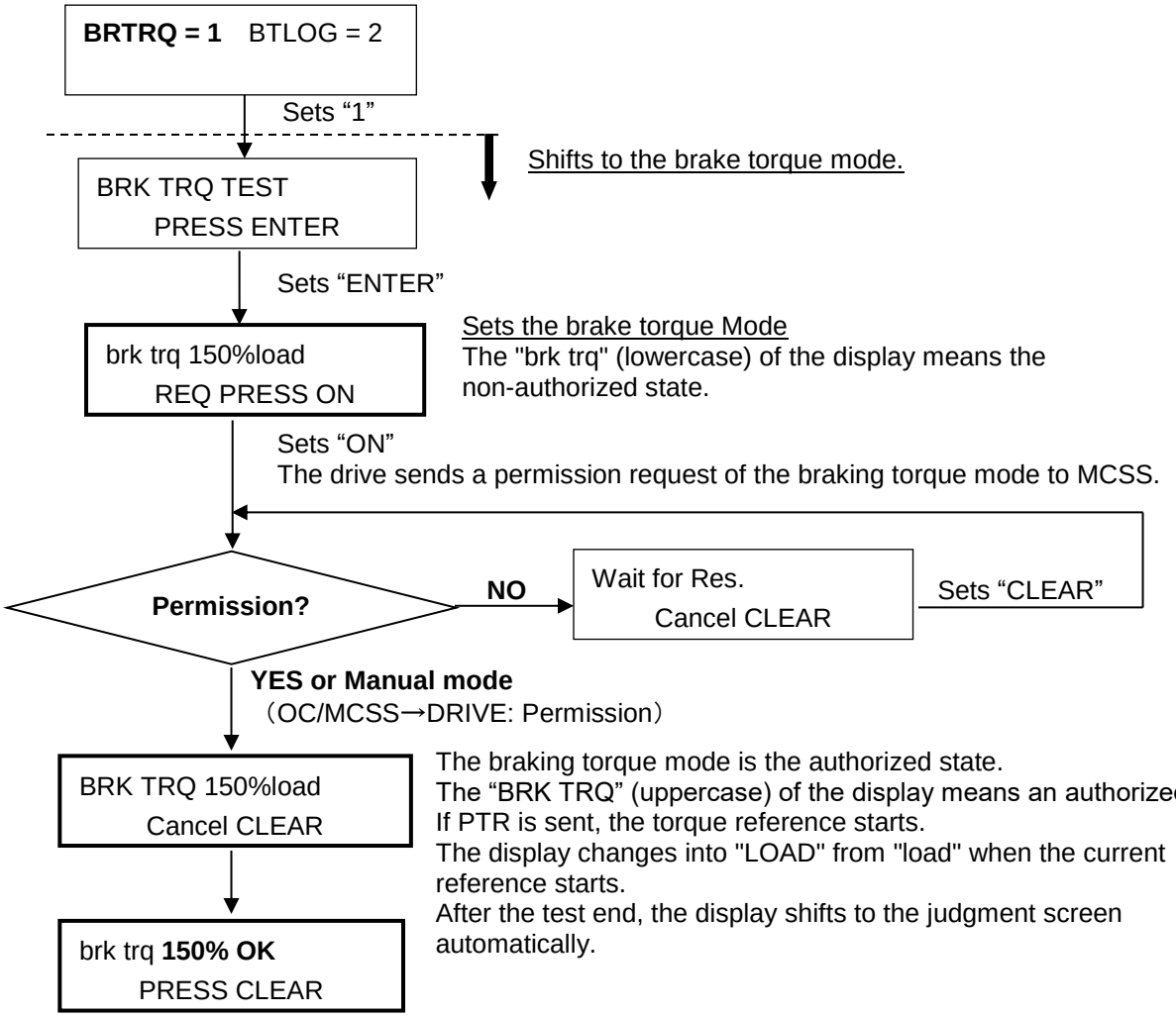
Reference document: 30924_SDD_BrakeTrq

**Purpose**

- Provides an inspection tool of braking torque.
- This test mode provides the safe quality of the brake.

**Effect**

- This brake torque tool becomes improvement of maintenance.
- The braking torque test can be done easily.
- The test weight transportation cost is reduced, because test-weights are unnecessary.




**Flow chart of the SVT operating method**

## 6.9.4 5-4 Brk Open TST

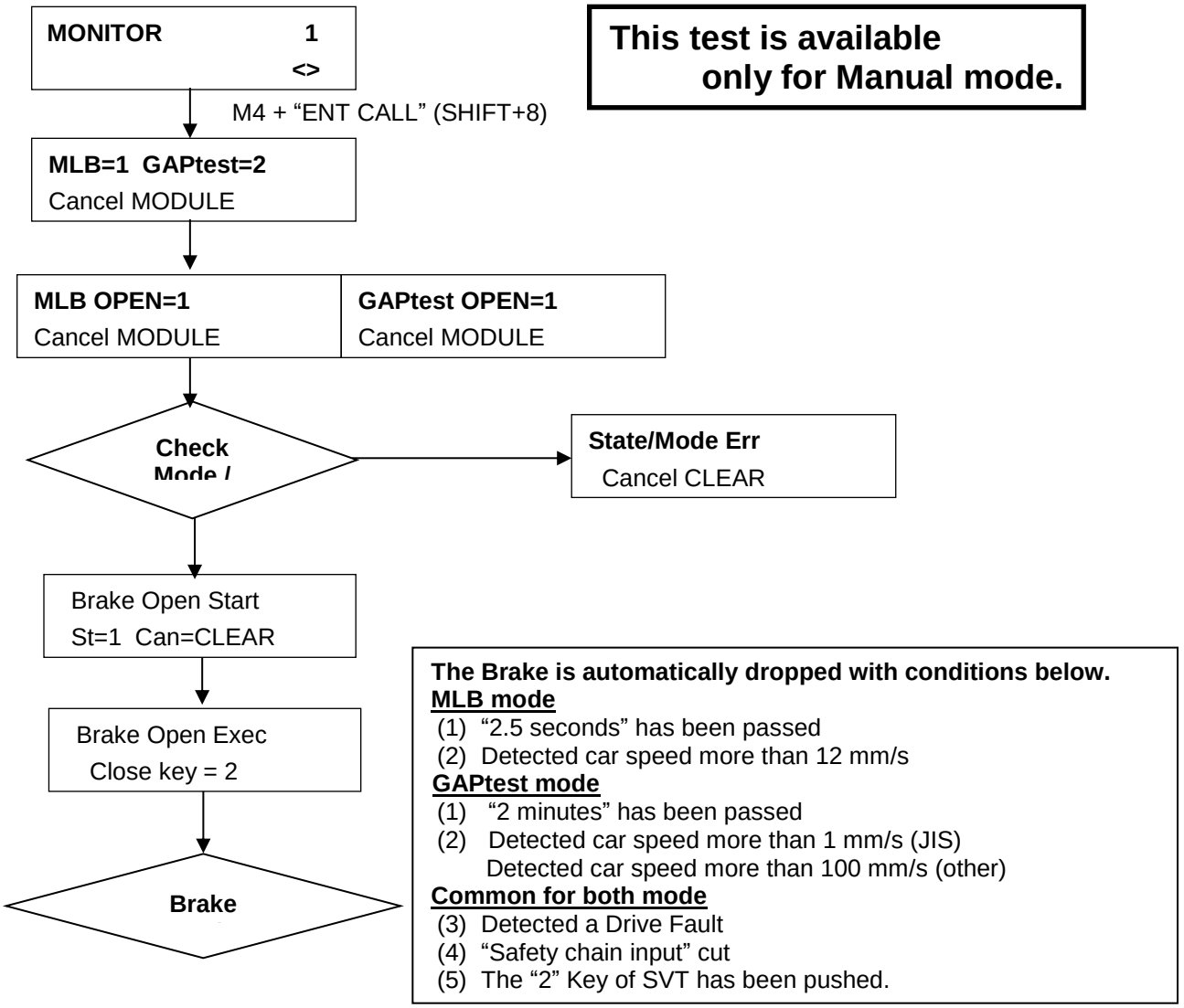
Reference document: 30924_SDD_BrakeTrq
This menu has been blinded because we use this only for some brake test.
This function is applied for JIS system or HSOVF416/428/460 drive.

**Purpose**

- Manual Lift Brake by Brake Open mode.
- To check the gap of brake

**Effect**

- This Brake Open mode can do manual rescue operation only by Brake control without Inverter control.
- We can adjust the gap of brake for shipment test or maintenance.
- We can check the balanced load easily by using the Brake open test.



## 6.9.5 How to check the balanced load? (For PM machine)

This test is to check if the counter balance load is appropriate to weight.
The IM machine has not been verified for this function yet, so it is only for a reference if the machine is induction motor.

**Balanced load in car**

1. Sets a balance load in car
2. Moves the elevator to nearest floor to middle of hoist-way by a normal running (UP and Down) / this run is also OK for Manual run or Inspection run with MCSS operation. But it should be normal stop, not emergency stop like "700 Safety Chain".
3. Checks the monitor "`Unbalance %  kg`" on SVT F13 for each run
   The Unbalance % should be less than 5% when the car is balanced.
   Example1: UP [- 5% -90kg], Down [5% 90kg] ← This is good case.
   Example2: UP [ 0% 0kg], Down [10% 180kg] ← This is bad case. It is 90kg unbalance.
4. **Option** / When the "5-4 Brk Open TST" is available with the Manual mode, please check if the car moves during opened brakes. Note: This test must be done with the balanced load in car.

**No-load in car**

5. Removes all load weights in car, there is no load in car.
6. Moves the elevator to upper floor
7. Moves the elevator to middle floor of hoist-way by a normal running with **Down and no load in car**. Don't use the UP direction data, because the regen running has some error for this data.
8. Checks the monitor "`Unbalance %  kg`" on SVT F13
   The Unbalance % should be overbarance % when the car is no load.
   Referrence: M431 "Balance %" parameter
   Example3: Down [50% 900kg] ← In this case, removed load is 900kg at step5.

| Unbalance % | kg |
|---|---|
| 50 | 900 |

Note: The unbalance data has some error. The precision is +/- 5%.

## 6.9.6 5-5 Opt ARO TEST

**Background**:
This parameter is utilized to perform a ***customer turn over test*** for optimized ARO. First, the controller is put on inspection to go away from the floor, then this test is executed via the SVT. Immediately after the test is executed the controller should be put into normal mode to enable an ARO run to the floor. If the inspection switch is not turned on to normal mode then the controller will not issue a rescue run to the floor.

When this test is activated, Optimized ARO is activated. The drive will pick the AR relay which disconnects power from the drive and controller. After a timeout, the drive will enter ARO mode and will activate the converter to generate power for the controller. It will then wait for an ARO run command from the controller. After the run is complete, the drive will exit ARO mode and drop the AR relay, thereby restoring line power to the controller and drive.

**Test steps:**

1. Switch controller to INSPECTION.
2. Move car on INSPECTION away from floor.
3. Initiate ARO TURNOVER TEST in drive using SVT menu M455.
4. Switch controller to NORMAL.
5. VERIFY that the car moves to a floor on ARO.

## 6.9.7 5-6 BUFFER/ETSD

The buffer/ETSD test is a test run with disabled stop control point and disabled 1LS / 2LS, i.e. the car runs with steady speed until it hits the final limit switch, the buffer, the ETSD switches etc. .
The speed for this test can be adjusted by the parameter `Buffer/ETSD mm/s` .
The test allows to check the ETS devices or the car / CWT buffer with a speed independent from the limitation for a correction run.
Note: the value of this parameter is automatically limited to `Duty Speed mm/s` and `Nom Speed mm/s` (whatever is lower).

The SVT display sequence after entering menu 5-6 is shown below:

Make sure that there are no passengers in car

```
No passengers in
car? Press ENTER
```
<ENTER>

Test speed `Buffer/ETSD mm/s` has to be confirmed.

```
Test Speed  mm/s
1000     y=1/n=0
```
<1>

Enter requested test direction:
1 for Run Down into 1LS (for e.g. car buffer test)
2 for Run Up into 2LS (for e.g. CWT buffer test)

```
Run DN to 1LS =1
Run UP to 2LS =2
```
<1> <2>

Test run is started when a CORR run down / up has been initiated by the controller (e.g. GECB, SP).
Note: One additional non-correction run is allowed in order to adjust car position.
This mode is aborted when:
- no CORR run in requested direction is performed within three runs,
- no run is performed within 60 sec.
- when CLEAR button has been pressed,
- on power-down.

```
Buff/ETSD Tst DN
ON: Press ENTER
```
<ENTER>

```
Buff/ETSD Tst UP
ON: Press ENTER
```
<ENTER>

```
Next Corr Down
hits Buffer/ETSD
```

```
Next Corr Up
hits Buffer/ETSD
```

**ATTENTION: If the test menu is left at this point and a CORR run down is started within the next 2 runs, the CORR run will run onto the buffer!**

The actual speed is displayed during test run

```
Buff/ETSD Tst DN
Speed/mm/s  1000
```

```
Buff/ETSD Tst UP
Speed/mm/s  1000
```

Test run is completed when the safety chain opens.

```
Buff/ETSD Tst DN
Complete       >
```

```
Buff/ETSD Tst UP
Complete       >
```

A test abort is displayed for the following scenarios:

| | |
|---|---|
| `Timeout: Test aborted >` | Abort if the CORR run in the selected direction has not been started within 60sec after “Next Corr Down/Up hits buffer” |
| `Too many runs: Test aborted >` | Abort if the 2nd run in the test mode is not a CORR run (and the 1st was not the selected CORR run, either). |
| `CORR in bad dir: Test aborted >` | Abort if the 2nd run in the test mode is a CORR run **not** in the selected direction. |
| `Switched Tests: Test aborted >` | Abort if the user leaves the test dialog of the Buffer/ETSD test and enters the SVT menu of the NTSD test (or vice versa). |
| `<CLEAR> pressed: Test aborted >` | Abort if the <CLEAR> key on the SVT is pressed. |
| `CAN abort cmd: Test aborted >` | Abort if the GECB sends a CAN command to abort the test mode. |

## 6.9.8 5-7 NTSD TEST

The NTSD test is a test run (started as CORR run) that is terminated by the NTSD (“Normal Terminal Stopping Device”) function as the regular profile is targeted to a point beyond the terminal landing. This requires recovery of position in 1LS/2LS.
The speed for this test can be adjusted by the parameter `Buffer/ETSD mm/s` .
For the purpose of this test, the CORR speed can be raised above the 2m/s limit applied to regular CORR runs.
Note: the value of this parameter is automatically limited to `Duty Speed mm/s` and `Nom Speed mm/s` (whatever is lower).

The SVT display sequence after entering menu 5-7 is shown below:

Make sure that there are no passengers in car

```
No passengers in
car? Press ENTER
```
<ENTER>

Test speed `Buffer/ETSD mm/s` has to be confirmed.

```
Test Speed  mm/s
4000     y=1/n=0
```
<1>

Enter requested test direction:
1 for Run Down into 1LS (for NTSD test)
2 for Run Up into 2LS (for NTSD test)

```
Run DN to 1LS =1
Run UP to 2LS =2
```
<1> <2>

Test run is started when a CORR run down / up has been initiated by the controller (e.g. GECB, SP).
Note: One additional non-correction run is allowed in order to adjust car position.
This mode is aborted when:
- no CORR run in requested direction is performed within three runs,
- no run is performed within 60 sec.
- when CLEAR button has been pressed,
- on power-down.

```
NTSD Test DOWN
ON: Press ENTER
```
<ENTER>

```
NTSD Test UP
ON: Press ENTER
```
<ENTER>

```
Next Corr Down
runs into NTSD
```

```
Next Corr Up
runs into NTSD
```

**ATTENTION: If the test menu is left at this point and a CORR run down is started within the next 2 runs, the CORR run will potentially be executed at more than 2m/s!**

The actual speed is displayed during the test run

```
NTSD Test DOWN
Speed/mm/s  3999
```

```
NTSD Test UP
Speed/mm/s  4001
```

and the NTSD decel phase is indicated.

```
NTSD decel
Speed/mm/s  2683
```

```
NTSD decel
Speed/mm/s  2683
```

The test run is completed successfullywhen the CORR run completes without ESTOP.

```
NTSD Test DOWN
Complete      >
```

```
NTSD Test UP
Complete      >
```

A test abort is displayed for the following scenarios:

All abort scenarios described in 5-6 BUFFER/ETSD. Additionally:

| |
|---|
| ESTOP:<br>Test aborted > |

Abort if the NTSD deceleration was interrupted by an ESTOP (potentially triggered the final limit switch or ETSD).

### 6.9.9 5-8 OVERSPEED TEST

The overspeed test is a test run where overspeed threshold and speed reference are increased so the Governors mechanical and electrical settings can be safely tested in the field. This function is only applicable to the interface type = 1 configuration.

For the purpose of this test, the overspeed threshold and the speed reference are changed by entering the absolute velocity in SVT. The maximum velocity for the test is 130% of the normal speed (Nom Speed mm/s) and the minimum value is the same as the normal speed (Nom Speed mm/s) which is default value.

Set the desirable overspeed value to the "GovOverSpd mm/s" in the menu 3-5.

```
GovOverSpd mm/s
600 > XXXXX
```

<ENTER>

The SVT display sequence after entering menu 8-4 (Ultra Drive) and 5-8 (GDCB1) is shown below:

Move the car into the starting position at the first. Make sure that there are no passengers in car

```
No passengers in
car? Press ENTER
```

<ENTER>

Test speed has to be confirmed.

```
Test Speed  mm/s
600     y=1/n=0
```

<1>

Confirmed the test.

```
Over Speed Test
ON : Press Enter
```

<ENTER>

Test run is started when normal run has been initiated by the controller (e.g. GECB, SP).

```
Start normal
run for Test
```

This mode is aborted when:
- no run is performed within 60 sec.
- when CLEAR button has been pressed,
- abort command from controller
- on power-down.

**ATTENTION: If the test menu is left at this point then, the test is aborted.**

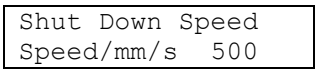
The actual speed is displayed during the test run

```
Overspeed Test
Speed/mm/s  600
```

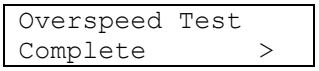
The speed at ESTOP is latched when E-Stop occurs by governor trip

```
Speed at ESTOP
Speed/mm/s  601
```

If there is no ESTOP by governor trip within 15 seconds, then the speed is reduced to normal and the car reaches to the target floor. Then, the SVT display shows the test abort stage.

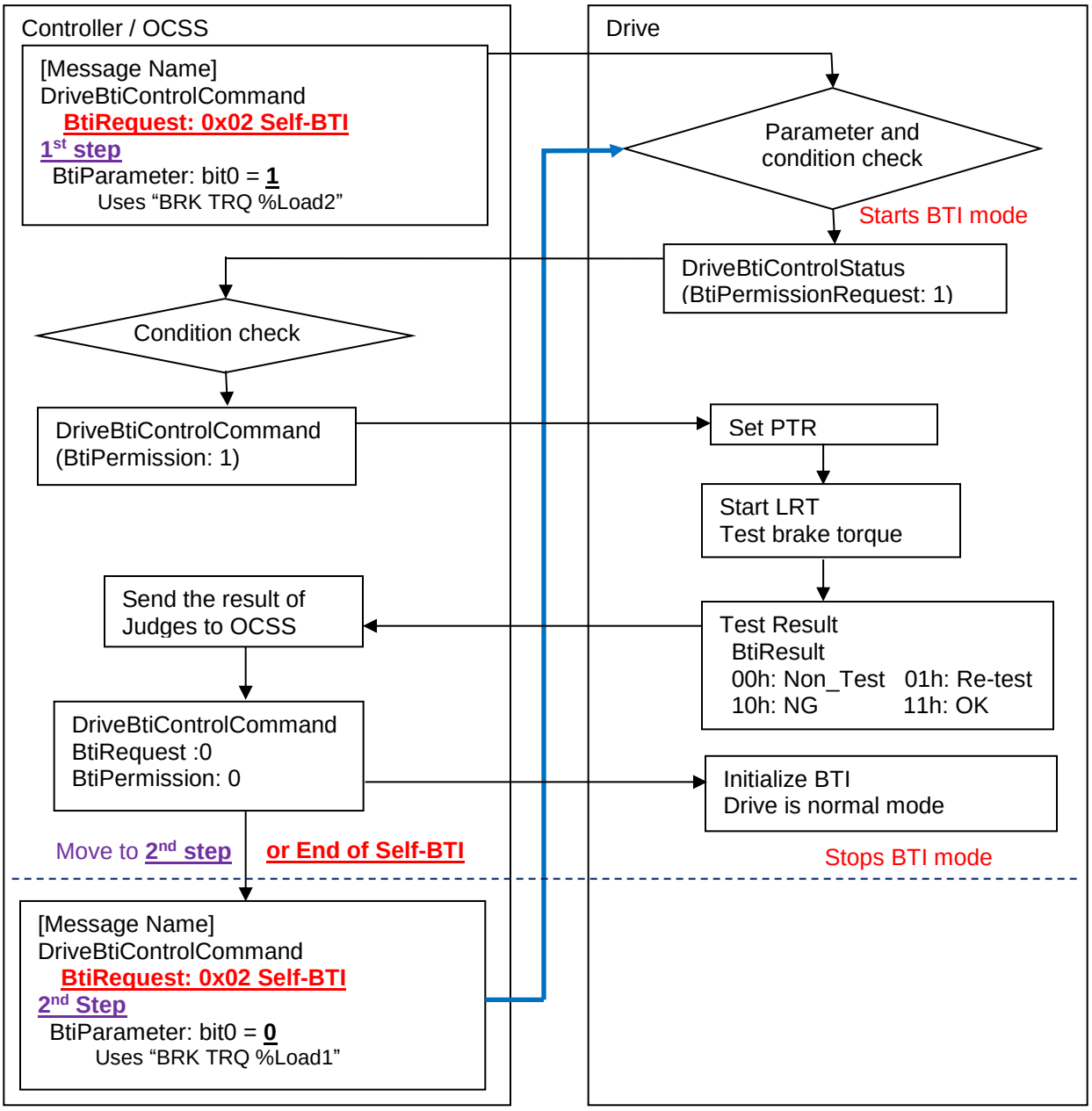



After use enters GOON, the test run is completed successfully.



### 6.9.10 Self-BTI

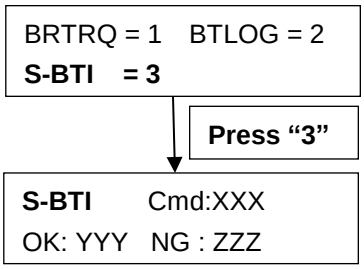
Reference document: 30924_DRS_Self-BTI
This is an extended feature of Remote BTI test.
Controller will automatically check the brake condition on a specific calendar schedule.




If this test is NG, Elevator moves to the lockup operation.
The blocked mode is canceled by the following operation.
-Good result of Manual BTI test
-Special command request by SVT. (*F-(Shift+4)- (Shift+8)- Enter and Password = 820)*

**Self-BTI result count display**

Displays this menu by “F + Shift4”




XXX: Count Self-BTI request message from OCSS
YYY: Count Self-BTI success
ZZZ: Count Self-BTI failed
This count is cleared by software reset or press “ENTER”

# 7 Data Acquisition Tool

The Data Acquisition Tool (DAT), Software Configuration Number AAA30959AAA, is a PC-based application for acquiring data from the drive using the drive service tool port. Refer to the DAT Operating Manual, Otis document 55840, for a description on how to use the application.

## 7.1 Signals

Different signals can be specified for data acquisition by setting the desired signal for each of the four channels in the DAT. Each signal has a default gain that can be modified using the up/down buttons in the DAT. The gain should be increased to achieve the maximum dynamic range without exceeding 100% of the available dynamic range. The percentage of dynamic range is indicated in the DAT.

Note that if the DAT is not being used, and it is desired to select signals for the DACs on the Option Board, the signals can be selected by entering the signal number directly in service tool menu **6-3 DAC**. The signals that are available for acquisition are given in the following table.

| DAT DEFINES VERSION 79 | | | |
|---|---|---|---|
| | **Signal Name** | **Units** | **Description** |
| **Inverter Current Regulators** | | | |
| 0 | Inv Ix | Amps | Inverter X-phase current feedback |
| 1 | Inv Iy | Amps | Inverter Y-phase current feedback |
| 2 | Inv Iz | Amps | Inverter Z-phase current feedback |
| 3 | Inv Id Ref | Amps | Inverter synchronous d-axis current regulator reference |
| 4 | Inv Id Fbk | Amps | Inverter synchronous d-axis current regulator feedback |
| 5 | Inv Id Err | Amps | Inverter synchronous d-axis current regulator error |
| 6 | Inv Iq Ref | Amps | Inverter synchronous q-axis current regulator reference |
| 7 | Inv Iq Fbk | Amps | Inverter synchronous q-axis current regulator feedback |
| 8 | Inv Iq Err | Amps | Inverter synchronous q-axis current regulator error |
| 9 | Inv Vde | Duty(%) | Inverter synchronous d-axis voltage command |
| 10 | Inv Vqe | Duty(%) | Inverter synchronous q-axis voltage command |
| 11 | Inv Vds | Duty(%) | Inverter stationary d-axis voltage command |
| 12 | Inv Vmag | Duty(%) | Inverter voltage command magnitude squared |
| 13 | Inv Vmag Filt | Duty(%) | Inverter voltage command magnitude squared and filtered |
| 14 | Inv Vx | Duty(%) | Inverter X-phase voltage command |
| 15 | Inv Vy | Duty(%) | Inverter Y-phase voltage command |
| 16 | Inv Vz | Duty(%) | Inverter Z-phase voltage command |
| 17 | Inv Dead x | Duty(%) | Inverter X-phase dead-time compensation voltage command |
| 18 | Inv Dead y | Duty(%) | Inverter Y-phase dead-time compensation voltage command |
| 19 | Inv Dead z | Duty(%) | Inverter Z-phase dead-time compensation voltage command |
| 20 | Inv IMAGSQRT | Amps | Inverter current |
| 21 | Inv Downshift | PU | Flag to indicate Inverter PWM downshift |
| **Converter Current Regulators** | | | |
| 22 | Cnv Ix | Amps | Converter X-phase current feedback |
| 23 | Cnv Iy | Amps | Converter Y-phase current feedback |
| 24 | Cnv Iz | Amps | Converter Z-phase current feedback |
| 25 | Cnv Id Ref | Amps | Converter synchronous d-axis current regulator reference |
| 26 | Cnv Id Fbk | Amps | Converter synchronous d-axis current regulator feedback |
| 27 | Cnv Id Err | Amps | Converter synchronous d-axis current regulator error |
| 28 | Cnv Iq Ref | Amps | Converter synchronous q-axis current regulator reference |
| 29 | Cnv Iq Fbk | Amps | Converter synchronous q-axis current regulator feedback |
| 30 | Cnv Iq Fil | Amps | Converter synchronous q-axis current regulator filtered feedback |
| 31 | Cnv Iq Err | Amps | Converter synchronous q-axis current regulator error |
| 32 | Cnv Vde | Duty(%) | Converter synchronous d-axis voltage command |
| 33 | Cnv Vqe | Duty(%) | Converter synchronous q-axis voltage command |
| 34 | Cnv Vds | Duty(%) | Converter stationary d-axis voltage command |
| 35 | Cnv Vmag | Duty(%) | Converter voltage command magnitude squared |
| 36 | Cnv Vx | Duty(%) | Converter X-phase voltage command |
| 37 | Cnv Vy | Duty(%) | Converter Y-phase voltage command |

| | | | |
|---|---|---|---|
| 38 | Cnv Vz | Duty(%) | Converter Z-phase voltage command |
| 39 | Cnv ZeroState | PU | Converter PWM zero state |
| 40 | Cnv Dead x | Duty(%) | Converter X-phase dead-time compensation voltage command |
| 41 | Cnv Dead y | Duty(%) | Converter Y-phase dead-time compensation voltage command |
| 42 | Cnv Dead z | Duty(%) | Converter Z-phase dead-time compensation voltage command |
| 43 | Cnv Notch In | PU | Converter notch filter input |
| 44 | Cnv Notch Out | PU | Converter notch filter output |
| **Bus Voltage Regulator** | | | |
| 45 | Vbus Ref | Volts | Bus voltage regulator reference |
| 46 | Vbus Fbk | Volts | Bus voltage regulator feedback |
| 47 | Vbus Err | Volts | Bus voltage regulator error |
| **Gain Scheduling for Current Regulators** | | | |
| 48 | Inv Id K gsch | PU | Inverter d-axis gain scheduling factor |
| 49 | Inv Iq K gsch | PU | Inverter q-axis gain scheduling factor |
| 50 | Cnv Id K gsch | PU | Converter d-axis gain scheduling factor |
| 51 | Cnv Iq K gsch | PU | Converter q-axis gain scheduling factor |
| **Phase Lock Loop (PLL)** | | | |
| 52 | PLL Vmag Out | PU | PLL voltage magnitude squared, low-pass filter output |
| 53 | PLL Vmag In | PU | PLL voltage magnitude squared, input to low-pass filter |
| 54 | PLL Vds filt | PU | PLL filtered line-to-line voltage during single-phase operation |
| 55 | PLL Vxy smpl | Volts | PLL Vx-Vy (from A/D converter + scaling). |
| 56 | PLL Vyz smpl | Volts | PLL Vy-Vz (from A/D converter + scaling) |
| 57 | PLL Vxz(Batt) | Volts | PLL Vx-Vz (from A/D converter + scaling). This variable is used to capture battery voltage for Low cost regen drive in battery mode, or ARO_BOOST mode |
| 58 | PLL Vds | PU | PLL synchronous d-axis voltage feedback |
| 59 | PLL Vqs | PU | PLL synchronous q-axis voltage feedback |
| 60 | PLL Vde | PU | PLL stationary d-axis voltage feedback |
| 61 | PLL sin | PU | PLL sine |
| 62 | PLL PI Fbk | PU | PLL regulator feedback |
| 63 | PLL Nseq In | PU | PLL q-axis negative sequence voltage |
| **Locked Rotor Test (LRT)** | | | |
| 64 | LRT theta | PU | LRT small signal angle |
| 65 | LRT sin | PU | LRT small signal sine |
| 66 | LRT theta1 | PU | LRT motor electrical angle |
| 67 | LRT Ld | PU | LRT inductance calculation |
| 68 | LRT Id A1 | PU | LRT A1 DFT coefficient for current feedback |
| 69 | LRT Id B1 | PU | LRT B1 DFT coefficient for current feedback |
| 70 | LRT Vd A1 | PU | LRT A1 DFT coefficient for voltage command |
| 71 | LRT Vd B1 | PU | LRT B1 DFT coefficient for current command |
| 72 | LRT Ld A1 | PU | LRT A1 DFT coefficient for inductance calculation |
| 73 | LRT Ld B1 | PU | LRT B1 DFT coefficient for inductance calculation |
| 74 | LRT Ld A2 | PU | LRT A2 DFT coefficient for inductance calculation |
| 75 | LRT Ld B2 | PU | LRT B2 DFT coefficient for inductance calculation |
| **MCSS Interface** | | | |
| 76 | MCSS VEL | mm/sec | Velocity command from MCSS |
| 77 | MCSS ACC | mm/sec^2 | Acceleration command from MCSS |
| 78 | MCSS LW | % | Load weigh % command from MCSS |
| **Encoder** | | | |
| 79 | ENC WR | mm/sec | Velocity feedback, unfiltered (does not include adjustment at low speeds). For speed feedback with low speed calculation, see "ENC WR INC" |
| 80 | ENC time | PU | Time accumulated since last encoder edge was detected, in T4 cnts |
| 81 | ENC DELTAM | PU | Encoder counts captured since last encoder read cycle |
| 82 | ENC TNEW | PU | Time of the last encoder transition |
| 83 | ENC MNEW | PU | Encoder count at the beginning of the velocity task |
| 84 | ENC WR S/C | mm/sec | Speed calculated from sinusoidal encoder. |
| 85 | ENC WR INC | mm/sec | Speed calculation based on incremental pulses for both encoder types. |
| 86 | ENC SIN | PU | SINE wave component of sinusoidal encoder. |
| 87 | ENC COS | PU | COSINE wave component of sinusoidal encoder. |

| | | | |
|---|---|---|---|
| 88 | ENC RES PER | PU | Number of encoder sinusoidal periods passed by during one speed calculation cycle (1ms) |
| **Velocity Regulators** | | | |
| 89 | Vel Inner Ref | mm/sec | Inner velocity regulator reference |
| 90 | Vel Inner Fbk | mm/sec | Inner velocity regulator feedback, unfiltered |
| 91 | Vel Inner Err | mm/sec | Inner velocity regulator error |
| 92 | Vel Outer Ref | mm/sec | Outer velocity regulator reference |
| 93 | Vel Outer Fbk | mm/sec | Outer velocity regulator feedback, unfiltered |
| 94 | Vel Outer Err | mm/sec | Outer velocity regulator error |
| 95 | Vel Obser Out | mm/sec | Velocity Observer Output |
| 96 | Vel Track Err | mm/sec | Tracking error between velocity feedback and observer output |
| 97 | Vel Notch In | mm/sec | Velocity notch filter 1 input |
| 98 | Vel Notch Out | mm/sec | Velocity notch filter 1 output |
| 99 | Vel Notch2 In | mm/sec | Velocity notch filter 2 input |
| 100 | Vel Notch2 Out | mm/sec | Velocity notch filter 2 output |
| 101 | VFbkFil[mm/s] | mm/sec | Velocity feedback, filtered |
| 102 | VFbkRaw[mm/s] | mm/sec | Velocity feedback, unfiltered |
| 103 | Vel Ref[mm/s] | mm/sec | Velocity reference |
| 104 | Accel[mm/s^2] | mm/sec^2 | Car acceleration measured at sheave, as used for PRS compensation. |
| **Pretorque** | | | |
| 105 | Pretorque | Amps | Pretorque current reference |
| 106 | HitchLoad[kg] | kg | |
| 107 | InCarLoad[%] | % | |
| 108 | LoadInfoTimer | 10ms | |
| **Fan Control** | | | |
| 109 | Fan PWM Count | PU | Fan PWM duty count |
| 110 | Fan PWM Duty | PU | Fan PWM duty cycle command, PU |
| 111 | Fan PWM Out | PU | Fan PWM signal |
| **DBR Control** | | | |
| 112 | DBR PWM Count | PU | DBR PWM duty count |
| 113 | DBR PWM Duty | PU | DBR PWM duty cycle command, PU |
| 114 | DBR PWM Out | PU | DBR PWM signal |
| **BRK Control** | | | |
| 115 | BRK_PWM_COUNT | PU | BRK PWM duty count |
| 116 | BRK_PWM_DUTY | PU | BRK PWM duty cycle command, PU |
| 117 | BRK_PWM_OUT | PU | BRK PWM signal |
| **Discretes** | | | |
| 118 | ESTOP Flag | PU | Flag to indicate ESTOP |
| 119 | Drive Fault | PU | Flag to indicate drive fault |
| 120 | Brk Lifted | PU | Flag to indicate Brake lifted (BL) |
| 121 | SX Relay | PU | Flag to indicate S1 and S2 relays are picked |
| 122 | DBD | PU | Flag to indicate status of Drive Brake Disconnect (normally-closed contacts of S1, S2, BY1 and BY2 relays) |
| 123 | SX N Open | PU | Flag to indicate status of normally-open contact of S1 relay |
| 124 | Safety Chain | PU | Flag to indicate status of Safety Chain input to drive |
| **Task Counters** | | | |
| 125 | Task 1MS | PU | 1 ms task counter |
| 126 | Task 10MS | PU | 10 ms task counter |
| 127 | Task 40MS | PU | 40 ms task counter |
| **Drive State** | | | |
| 128 | Drive State | PU | Enumerated drive state |
| 129 | Drive Substate | PU | Enumerated drive sub-state |
| **Internal Profile Generator** | | | |
| 130 | Profile Pos | m | Profile generator relative position (CAN and Manual Mode only) |
| 131 | Profile Vel | m/s | Profile generator velocity (CAN and Manual Mode only) |
| 132 | Profile Acc | m/s^2 | Profile generator acceleration (CAN and Manual Mode only) |

| | | | |
|---|---|---|---|
| 133 | Profile Jerk | m/s^3 | Profile generator jerk (CAN and Manual Mode only) |
| 134 | Profile SD | m | Profile generator stopping distance (CAN and manual mode only) |
| 135 | Profile DTG | m | Profile generator distance to go (CAN and manual mode only) |
| **Automatic Load Weigh Adjustment (ALWA)** | | | |
| 136 | Alwa Gain | % | Automatic Load Weigh Adjustment Gain |
| 137 | Alwa Offset | % | Automatic Load Weigh Adjustment Offset |
| **Internal Profile Generator** | | | |
| 138 | ProAdv Pos | m | Profile generator relative position advanced by 250ms. |
| 139 | ProAdv Vel | m/s | Profile generator velocity advanced by 250ms. |
| 140 | ProAdv SD | m/s^2 | Profile generator acceleration advanced by 250ms. |
| 141 | ProAdv FLAG | m/s^3 | Profile generator advanced state valid flag. |
| **Position Regulator (Applicable only to CAN mode)** | | | |
| 142 | Position Ref | 0.1 mm | Position regulator reference (CAN and Manual Mode only) |
| 143 | Position Fbk | 0.1 mm | Position regulator feedback (CAN and Manual Mode only) |
| 144 | Position Err | 0.1 mm | Position regulator error (CAN and Manual Mode only) |
| 145 | Position Dtg | 0.1 mm | Distance to go to target (CAN and Manual Mode only) |
| 146 | Pos Ref (ac) | 0.1 mm | Position regulator reference, AC-coupled for frequency test |
| 147 | Pos Fbk (ac) | 0.1 mm | Position regulator feedback, AC-coupled for frequency test |
| 148 | Pos Track Err | 0.1 mm | Position tracking error (CAN and Manual Mode only) |
| 149 | Pos Direction | PU | Direction command that is latched at the beginning of the run |
| **Secondary Magnet Position Estimator** | | | |
| 150 | Mot d-voltage | PU | Estimated d-axis motor voltage (back-emf) |
| 151 | Mot q-voltage | PU | Estimated d-axis motor voltage (back-emf) |
| 152 | Mot we | mm/s | Motor electrical frequency (accounts for car direction and motor phasing) |
| 153 | Sat factor | PU | Estimate of inductance saturation as a function of current |
| 154 | Magnet err | PU | Difference between magnet position estimate and encoder |
| **Power Calculations** | | | |
| 155 | Inv power | W | Inverter power estimate |
| 156 | Cnv power | W | Converter power estimate |
| 157 | Drive p loss | W | Power loss estimate (2Hz filtered) |
| 158 | Drive p loss2 | W | Power loss estimate (10Hz filtered) |
| 159 | DC Link Pwr | W | Transient power into DC capacitors C*V*dv/dt |
| 160 | Pre chrg Pwr | W | Power in precharge resistors |
| 161 | Balance R Pwr | W | Power in balance resistors |
| 162 | Reactor Pwr | W | Transient power in line reactor L*di/dt |
| 163 | PLoss Thrsh | W | Power loss threshold for DC capacitor failure detection |
| **Power Factor Control (PFC)** | | | |
| 164 | Pfc ref | Duty(%) | Power Factor Control reference |
| 165 | Pfc fbk | Duty(%) | Power Factor Control feedback |
| 166 | Pfc err | Duty(%) | Power Factor Control error |
| 167 | Pfc out | A | Power Factor Control output |
| **Field Weakening Control (FWC)** | | | |
| 168 | Fwc ref | Duty(%) | Field Weakening Control reference |
| 169 | Fwc fbk | Duty(%) | Field Weakening Control feedback |
| 170 | Fwc err | Duty(%) | Field Weakening Control error |
| 171 | Fwc out | A | Field Weakening Control output |
| **Field Orientation** | | | |
| 172 | Enc theta(e) | rad | Encoder electrical angle |
| 173 | Inv theta | rad | Field Orientation angle (induction motor only) |
| 174 | Inv thetaSlip | rad | Slip angle (induction motor only) |
| 175 | Inv we | mm/s | Motor Electrical frequency (based on encoder feedback) |
| 176 | Flux estimate | A | Rotor flux estimate (induction motor only) |
| **Vanes (applicable only to CAN mode)** | | | |
| 177 | Vane TransOcc | PU | Flag to indicate PRS transition occurred (CAN Mode only) |
| 178 | PrsSpikesFltd | PU | Count of filtered PRS states, see description in SVT monitor M-1-7 |
| 179 | Last SpikeLen | Samples | Length of last filtered PRS state, see description in SVT monitor M-1-7 |
| 180 | Vane Last Dev | 0.1 mm | Difference between detected and expected transitions (CAN Mode only) |
| 181 | Vane Last Cor | 0.1 mm | Last correction made to position feedback (CAN Mode only) |
| 182 | VaneExpValid | PU | Flag indicating that a valid expectation for the next PRS vane transition exists |

| | | | |
|---|---|---|---|
| 183 | VaneTrnsLoLim | 0.1 mm | Lower position limit [0.1mm] for next expected PRS vane transition |
| 184 | VaneTrnsUpLim | 0.1 mm | Upper position limit [0.1mm] for next expected PRS vane transition |
| **Hoistway Signals** | | | |
| 185 | HwySigUnfiltd | PU | Hoistway signals (of the PRS) unfiltered |
| 186 | HwySigLpFiltd | PU | Hoistway signals (of the PRS) low pass filtered |
| 187 | HwySig10msTsk | PU | Filtered HwySig_1msTsk used by control functions in 10ms task. Only valid combinations are accepted. |
| 188 | HSVT Flags | Bitfield | High Speed Vane Tracking states, bit significance: See code |
| 189 | HsBufIndxRead | PU | Hoistway Signal Buffer: Pointer to next read element. |
| 190 | HsBufIdxWrite | PU | Hoistway Signal Buffer: Pointer to next write element. |
| 191 | ZoneMainVane | PU | PRS zone on vane overlapping PRS sensor head most |
| 192 | ZoneOtherVane | PU | PRS zone on potential other vane overlapping PRS sensor head |
| 193 | ZonesAreValid | PU | Flag indicating that PRS signals indicate valid vane zones |
| 194 | DoorZoneSignl | PU | lag indicating to control functions that car is in door zone (active if both LV1 and LV2 are active). Only updated for valid hwy signal combinations. |
| 195 | 1LS | PU | The 1LS signal that is receieved over CAN. |
| 196 | 2LS | PU | The 2LS signal that is receieved over CAN. |
| 197 | FbkPosErrMarg | PU | Error margin for drive's feedback position in 1/10mm, e.g. set to 20cm (200) for well known position (NORMAL runs). |
| 198 | SS EncPos | 0.1mm | Single sensor encoder position, relative to last PRS transition (:=0 at transition). |
| 199 | SS maxPosWoTr | 0.1mm | Maximum value of "SS EncPos" since last PRS transition. |
| 200 | SS minPosWoTr | 0.1mm | Minimum value of "SS EncPos" since last PRS transition. |
| 201 | SS uprZoneLim | 0.1mm | Upper limit mm-position of current vane zone, i.e. of position range w/o PRS transition. |
| 202 | SS lwrZoneLim | 0.1mm | Lower limit mm-position of current vane zone, i.e. of position range w/o PRS transition. |
| 203 | SS Flags | PU | Codes flags and states of Single-Sensor algorithms, see source code. |
| **Floor Information** | | | |
| 204 | Floor.current | PU | Indicates the current floor |
| 205 | Floor.nxtComm | PU | Indicates the next committable floor |
| 206 | Floor.accpTgt | PU | Indicates the accepted target floor |
| **CAN Information** | | | |
| 207 | CanRun.mode | PU | Describes the type of run that is currently executed |
| 208 | CanRun.cmd | PU | Accepted, currently valid run command. |
| 209 | CanRun.status | PU | Status of ongoing run. |
| 210 | CanRun.requst | PU | Request from within the drive to execute a run. |
| 211 | CanRn.ablSta | PU | Advanced Brake Lift: 0=ABL_INACTIVE, 1= ABL_ACTIVE, 2= REMOVING_ABL. |
| 212 | RunHdl.cmd | PU | Command from RunHandler to StateMachine controlling ABL, EndRun. |
| 213 | newMsgFlags | PU | |
| 214 | CanStopCmd | PU | Flag indicating that the drive has received a CAN command to stop or that the state of the limit switches 1LS, 2LS is not known |
| **OPB Information** | | | |
| 215 | Opb.stopCmd | PU | Flag indicating that the drive has received a CAN command to stop. Reset when status is STOPPED |
| 216 | Opb.endRunCmd | PU | Flag indicating that the drive has received a CAN command to end the run with profiled deceleration. Reset when status is STOPPED |
| 217 | OpbDRC.mode | PU | Mode parameter from DriveRunCommand message received. |
| 218 | OpbDRC.dir | PU | Direction parameter from DriveRunCommand message received |
| 219 | OpbDRC.prof | PU | Profile index parameter from DriveRunCommand2 message received.<br>Note: when DriveRunCommand message is received then this value is = 0. |
| 220 | OpbDGL.tgtLdg | PU | Target landing received in a DriveGoToLanding message |
| 221 | OpbDGL.prof | PU | Profile index received in a DriveGoToLanding message |
| 222 | OpbDC.cmd | PU | Command in DriveCommand message received. |
| 223 | OpbDC.option | PU | Option in DriveCommand message received. |
| **CAN Communications** | | | |
| 224 | SpeedCheckFlg | PU | Flag for speed check to TCBC (CAN Mode only) |
| 225 | RlevPermitTcb | PU | Flag for relevel permissive from TCBC (CAN Mode only) |
| 226 | LoadDataNotOk | PU | Flag for load weigh data invalid from TCBC (CAN Mode only) |
| 227 | RlevAbortRun | PU | |
| 228 | Rlev\Nrz@Decl | PU | |

| | | | |
|---|---|---|---|
| 229 | HovRlev State | PU | |
| **Velocity Loop** | | | |
| 230 | velOuterKp | PU | Proportinal gain for outer vel loop |
| 231 | velOuterKi | PU | Integral gain for outer vel loop |
| 232 | velInnerKp | PU | Inner velocity loop gain |
| 233 | velLoopB0 | PU | Vel loop filter B0 coefficint |
| 234 | velLoopA1 | PU | Vel loop filter A1 coefficint |
| **Torque Observer** | | | |
| 235 | Torque I Obs | A | Torque observer output |
| 236 | Trq I Obs Fil | A | Torque observer filtered output |
| 237 | Trq I Err Fil | A | Torque observer filtered error signal |
| 238 | Trq I Obs Err | A | Torque observer error signal |
| 239 | Trq Obs Err % | PU | Torque observer fault threshold |
| **Phase Lock Loop (PLL)** | | | |
| 240 | PLL Vde Latch | PU | PLL error variable latched before noise injected to it in testmode 4001 |
| 241 | PLL Vmag Flt | PU | PLL voltage magnitude squared, low-pass filter output at 0.8 Hz. |
| 242 | PLL Line2Neut | Volts | PLL line to line voltage in units of volts (rms). |
| 243 | PLL Line2Line | Volts Rms | PLL line to neutral voltage in units of volts (peak). |
| **Discretes** | | | |
| 244 | UIB | PU | UIB Signal State |
| 245 | DIB | PU | DIB Signal State |
| **Brake & JIS test** | | | |
| 246 | Brk I Fbk | mA | Brake current feedback (mA) when internal brake control active. |
| 247 | InvIqRefMax | Amps | Max of Inv Iq Ref for shock detection |
| 248 | InvIqRefMin | Amps | Min of Inv Iq Ref for shock detection |
| 249 | AbsInvIqDeff | Amps | Difference of InvIqRefMax and InvIqRefMin |
| 250 | shockDetected | PU | Flag of shock detection |
| 251 | Vel fbk Out | mm/sec | Velocity feedback, filtered, every 1ms task calculated |
| 252 | FlightLength | 0.1mm | Flight length of last run |
| **Brake States** | | | |
| 253 | BY Relay NC | PU | BY relay feedback (0-dropped/1-picked) |
| 254 | Brk Cnt stat | PU | BST - brake status feedback (0-dropped/1-picked) |
| 255 | BS1 | PU | BS1 - brake switch 1 |
| 256 | BS2 | PU | BS2 - brake switch 2 |
| 257 | BrkCurFbk | Amps | Brake Current Feedback |
| 258 | BrkCurRef | Amps | Brake Current Reference |
| 259 | Vd 6th sin | PU | component of d- axis voltage needed to achieve 6th harmonic inverter current regulation |
| 260 | Vd 6th cos | PU | component of d- axis voltage needed to achieve 6th harmonic inverter current regulation |
| 261 | Vq 6th sin | PU | component of q- axis voltage needed to achieve 6th harmonic inverter current regulation |
| 262 | Vq 6th cos | PU | component of d- axis voltage needed to achieve 6th harmonic inverter current regulation |
| 263 | Inv Id Kg2 | PU | The amount of gain reduction in the 6th harmonic inverter current regulator as a function of gain scheduling tuning parameters (see Ld sat/ sat slope in M(4)34) |
| 264 | Inv Iq Kg2 | PU | The amount of gain reduction in the 6th harmonic inverter current regulator as a function of gain scheduling tuning parameters (see Lq sat/ sat slope in M(4)34) |
| **Advanced Hovering Control (AHC)** | | | |
| 265 | Car PosRx | 0.1mm | The relative car position as received from the top of car encoder/sensor |
| 266 | Car Pos Latch | 0.1mm | The latched relative car position at the beginning of a run as received from the top of car encoder/sensor |
| 267 | Car Pos Delta | 0.1mm | The change in car position during a run as received from the top of car encoder/sensor |
| 268 | MachPos Latch | 0.1mm | The latched relative car position at the beginning of a run as received from the machine encoder |
| 269 | MachPos Delta | 0.1mm | The change in car position during a run as received from the machine encoder |
| 270 | Enc Pos Delta | 0.1mm | The difference in car position between the machine encoder and the top of car encoder |
| 271 | Car Velocity | mm/sec | The car velocity as calculated from the top of car encoder/sensor |

| | | | |
|---|---|---|---|
| 272 | AHC Dyne Fin | mm/sec | The advanced hovering control dyne resonance filter input |
| 273 | AHC Dyne Fout | mm/sec | The advanced hovering control dyne resonance filter output |
| 274 | AHC Notch In | mm/sec | The advanced hovering control notch filter input |
| 275 | AHC Notch Out | mm/sec | The advanced hovering control notch filter output |
| 276 | AHCPermissive | PU | The advanced hovering control run permissive (0–AHC not active, 1–AHC active) |
| **Self Commissioning** | | | |
| 277 | Self Result1 | various | These and the next 3 parameters take on different meanings depending on which self commissioning test is running. See Section 7.2 for further details. |
| 278 | Self Result2 | various | |
| 279 | Self Result3 | various | |
| 280 | Self Result4 | various | |
| **Software Test** | | | |
| 281 | Ref(ac) | PU | Regulator reference variable with major dc component removed, when the drive in in the associated test mode. |
| 282 | Err(ac) | PU | Regulator error variable, when the drive in in the associated test mode. The ac signifier is for consistency in the notation. |
| 283 | Fbk(ac) | PU | Regulator feedback variable with major dc component removed, when the drive in in the associated test mode. |
| 284 | Cmd(ac) | PU | Regulator output when the drive in in the associated test mode. The ac signifier is for consistency in the notation. |
| 285 | Test Frac 1 | PU | Test variable for fractional data type |
| 286 | Test Frac 2 | PU | Test variable for fractional data type |
| 287 | Test Frac 3 | PU | Test variable for fractional data type |
| 288 | Test Frac 4 | PU | Test variable for fractional data type |
| 289 | Test Frac 5 | PU | Test variable for fractional data type |
| 290 | Test Frac 6 | PU | Test variable for fractional data type |
| 291 | Test VFrac1 | PU | Test variable for fractional data type |
| 292 | Test VFrac2 | PU | Test variable for fractional data type |
| 293 | Test VFrac3 | PU | Test variable for fractional data type |
| 294 | Test VFrac4 | PU | Test variable for fractional data type |
| 295 | Test Int 1 | PU | Test variable for integer data type |
| 296 | Test Int 2 | PU | Test variable for integer data type |
| 297 | Test Int 3 | PU | Test variable for integer data type |
| 298 | Test Int 4 | PU | Test variable for integer data type |
| 299 | Test Int 5 | PU | Test variable for integer data type |
| 300 | Test Int 6 | PU | Test variable for integer data type |
| 301 | Test Long 1 | PU | Test variable for long data type |
| 302 | Test Long 2 | PU | Test variable for long data type |
| 303 | Test Long 3 | PU | Test variable for long data type |
| 304 | Test Long 4 | PU | Test variable for long data type |
| 305 | Test Flag 1 | PU | Test variable for flag data type |
| 306 | Test Flag 2 | PU | Test variable for flag data type |
| 307 | Test Flag 3 | PU | Test variable for flag data type |
| 308 | Test Flag 4 | PU | Test variable for flag data type |
| 309 | Debug Int 1 | PU | Debug variable for int data type |
| 310 | Debug Int 2 | PU | Debug variable for int data type |
| 311 | Debug Int 3 | PU | Debug variable for int data type |
| 312 | Debug Int 4 | PU | Debug variable for int data type |
| 313 | Debug Int 5 | PU | Debug variable for int data type |
| 314 | Debug Int 6 | PU | Debug variable for int data type |
| 315 | Debug Frac 1 | PU | Debug variable for frac data type |
| 316 | Debug Frac 2 | PU | Debug variable for frac data type |
| 317 | Debug Frac 3 | PU | Debug variable for frac data type |
| 318 | Debug Frac 4 | PU | Debug variable for frac data type |

## 7.2 Self Commissioning DAT variables

The self commissioning DAT variables take on different meanings depending upon which self commissioning test is running. The table below summarizes the meanings for each test.

| Test | Self Result 1 | Self Result 2 | Self Result 3 | Self Result 4 |
|---|---|---|---|---|
| **Kp Test** | gain | motorL (mH) | | |
| **Ki Test** | gain | motorR (Ohm) | | |
| **Lsigma Test** | | lsigma (mH) | | |
| **Sweep Test** | freq (Hz) | Re Z (Ohm) | Im Z (mH) | Im Z - lsigma (mH) |
| **RTC via Re Z** | freq (Hz) | Re Z (Ohm) | RTC via Re Z (sec) | |
| **RTC via Im Z** | freq (Hz) | | RTC via Im Z (sec) | Im Z - lsigma (mH) |
| **Fine tune** | Vd | Vd err | Self.filt.out | Fine tune state |
| **Inertia** | MRAS Out | MRAS err | MRAS x | Vel.outer.fbk |

## 7.3 Signal Groups

It is often desired to observe one signal simultaneously with several other closely related signals. The most common groupings of signals can be selected using the signal groups box on the DAT, and are listed in the following table.

| Signal Group Name | Description |
|---|---|
| Inv Ixyz | Inverter stationary current feedbacks: ix, iy, iz |
| Inv Id | Inverter synchronous d-axis regulator: idref, idfbk, iderr, idout |
| Inv Iq | Inverter synchronous q-axis regulator: iqref, iqfbk, iqerr, idout |
| Inv Vdq | Inverter synchronous voltage commands: vde, vqe, vds |
| Inv PWM | Inverter PWM voltage commands: vx, vy, vz |
| Cnv Ixyz | Converter stationary current feedbacks: ix, iy, iz |
| Cnv Id | Converter synchronous d-axis regulator: idref, idfbk, iderr |
| Cnv Iq | Converter synchronous q-axis regulator: iqref, iqfbk, iqerr |
| Cnv Vdq | Converter synchronous voltage commands: vde, vqe, vds, |
| Cnv PWM | Converter PWM voltage commands: vx, vy, vz |
| Vbus | Bus voltage regulator: vref, vfbk, verr |
| PLL | Phase Lock Loop (PLL) stationary voltage: vds, vqs, pllsin |
| LRT | Lock Rotor Test (LRT): smsg_angle, smsg_sin, Ld_theta, Ld |
| Inner Vel | Inner velocity regulator: vref, vfbk, verr |
| Outer Vel | Outer velocity regulator: vref, vfbk, verr |
| Vel Notch | Velocity notch filter #1: in, out |
| Cnv Notch | Converter notch filter: in, out |
| PLL LPF | Phase Lock Loop (PLL) low pass filter: in, out |
| Fan PWM | Fan PWM variables: count_duty, duty, out |
| DBR PWM | Not used (was applicable only for non-regen drives). |
| Inv Dead Comp | Inverter dead-time compensation: vx, vy, vz |
| Cnv Dead Comp | Converter dead-time compensation: vx, vy, vz |
| Test Frac IO | General test signals for software development: ch1, ch2, ch3, ch4 |
| Test Int IO | General test signals for software development: ch1, ch2, ch3, ch4 |
| Test Long IO | General test signals for software development: ch1, ch2, ch3, ch4 |
| Test Flag IO | General test signals for software development: ch1, ch2, ch3, ch4 |
| LRT Id DFT | Locked Rotor Test (LRT) Discrete Fourier Transform (DFT) Coefficients for id: a1, b1 |
| LRT Ld DFT | Locked Rotor Test (LRT) Discrete Fourier Transform (DFT) Coefficients for Ld: a1, b1 |
| MCSS Commands | Signals from MCSS: Vel, Acc, LW |
| Encoder | Encoder related signals |
| Brk PWM | Brake PWM variables: count_duty, duty, out |
| Pretorque | Pretorque command, brake lifted, velocity regulator output, inv iq fbk |
| Inv IMAGSQRT | Inverter current magnitude |
| SX | SX pick command, DBD, S1_NO, Safety chain |
| Profile Gen | Profile Generator: pos, vel, accel, jerk |
| Position | Position regulator: reference, feedback and error |
| Magnet Pos | Magnet Position Estimator: Vd, Vq, we |
| Drive Pow | Power estimates: Inv, Cnv, Loss |
| Pfc | Power Factor Controller: reference, feedback, error, out |
| Fwc | Field Weakening Controller: reference, feedback, error, out |
| Vane | Correction-to-Vane related signals |
| Rlev+SpdChk | Releveling and speed check related signals |
| Self Comm | Self Result1, Self Result2, Self Result3, Self Result4 |
| Freq Test | Used for loop tuning |
| User 1 | User-Defined Group #1 (See Document #55744 for additional details) |
| User 2 | User-Defined Group #2 (See Document #55744 for additional details) |
| User 3 | User-Defined Group #3 (See Document #55744 for additional details) |
| User 4 | User-Defined Group #4 (See Document #55744 for additional details) |

# 8 Engineering Test Modes

Several test modes are available that are useful in the development and tuning of drives. The test modes are expected to be used by Otis Engineering personnel only.

## 8.1 Overview

Test modes provide the capability to measure and adjust the performance of the drive control loops as well as perform other tests. The test modes are activated by using the engineering version of the Data Acquisition Tool (DAT), Software Configuration Number AAA30959AAA.

- The engineering version of the Data Acquisition Tool (DAT) allows special commands to be sent to the drive. The DAT must be active in order to enable the test modes.
- In certain test modes, an internal white noise generator is used to generate a test signal with broadband frequency content. It is injected into the control loop under test as determined by the test mode setting. The amplitude of the test signal is controlled by REF 1 in the DAT. Certain test modes also have additional offset signals controlled by REF 2 and REF 3.
- Test signals can be displayed in one of two ways. First, they can be displayed at full bandwidth (10kHz) on an oscilloscope or spectrum analyzer using the D/A converters on the Option Board. Alternatively, the signals can be digitally saved to a binary file using the DAT, but at reduced bandwidth (1kHz). The signals to be displayed are automatically determined by the test mode selected.

A list of available test modes is shown in Table 8-1.

| Test Mode Description |
|---|
| Normal Mode (MCSS or TCB-CAN) |
| Torque Test Mode |
| Rotating Current Vector Test Mode |
| Inner Velocity Test Mode |
| Outer Velocity Test Mode |
| Position Loop test mode |
| Magnetizing Current Test Mode (inv d –axis) |
| PWM Open-Loop Test Mode |
| Converter -Current Test Mode |
| DC Bus Voltage Test Mode |
| Power Factor Control (PFC) Test Mode |
| Field Weakening Control (FWC) Test Mode |
| Manual mode |
| Profile test mode |
| Magnet alignment test mode |
| Velocity notch filter test mode |

**Table 8-1 Test Modes**

## 8.2 Enabling and Changing Test Modes

***Special care must be taken when enabling a test mode or equipment damage may result! For example, feeding a constant torque current to an unloaded machine can cause the speed to increase out of control!!***

1. Attach a RS232-to-RS422 converter cable from the host PC to the drive service tool port.
2. Run the Data Acquisition Tool (DAT) on the host PC and verify communication.
3. Verify that both the PREPARE TO RUN and LIFT BRAKE switches are OFF. The drive will not enter test mode unless both of these commands are OFF.
4. Set the desired test mode by changing the test mode setting in the DAT.

***When in a test mode, the safety chain is monitored and must be established. Jumpers may have to be added to allow the drive to run in test mode.***

## 8.3 Exiting Test Modes

To terminate test mode operation, set the drive mode setting to normal. Discontinuing use of the Data Acquisition Tool (DAT) will also disable any of the test modes.

## 8.4 Test Mode I/O

Table 8-2 provides a reference of the test mode I/O. In the Table, the following abbreviations are used:

REF - Data Acquisition Tool (DAT) reference
CH - data logger channel or D/A channel
ref - control loop reference signal
fbk - control loop feedback signal
err - control loop error signal
out - control loop output signal

| Test Mode | Inputs | | | Outputs | | | |
|---|---|---|---|---|---|---|---|
| | REF 1 | REF 2 | REF 3 | CH 1 | CH 2 | CH 3 | CH 4 |
| NORMAL | - | - | - | - | - | - | - |
| Torque (Iq) | Noise Amplitude | Iq Offset | Id ref | Iq ref | Iq fbk | Iq err | Iq out |
| Motor Current Rotating Vector | Amplitude | Frequency | - | Ix | Iy | Iz | Id |
| Inner Velocity | Noise Amplitude | - | Id ref | Vinner ref | Vinner fbk | Vinner err | Vinner out |
| Outer Velocity | Noise Amplitude | - | - | Vouter ref | Vouter fbk | Vouter err | Vouter out |
| Position | Noise Amplitude | Pos offset | - | Pos ref | Pos fbk | Pos err | Pos out |
| Magnetizing Current (Id) | Noise Amplitude | Inv Id Offset | - | Id ref | Id fbk | Id err | Id out |
| Open-Loop PWM | X-phase duty | Y-phase duty | Z-phase duty | X duty | Y duty | Z duty | - |
| Converter d-axis Current | Noise Amplitude | Cnv Id Offset | - | Cnv Id ref | Cnv Id fbk | Cnv Id err | Cnv Id out |
| Bus Voltage | Noise Amplitude | Offset | - | Vb ref | Vb fbk | Vb err | Vb out |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| PFC | Noise Amplitude | Offset | - | PFC ref | PFC fbk | PFC err | PFC out |
| FWC | Noise Amplitude | Offset | - | FWC ref | FWC fbk | FWC err | FWC out |
| Manual | - | - | - | - | - | - | - |
| PROFILE | - | - | - | Profile Pos | Profile vel | Profile Acc | Profile Jerk |
| Align Magnet | - | Id Offset | - | Id ref | Id fbk | Id err | Vd |
| Velocy Notch | Noise Amplitude | offset | | Vel Notch 1 In | Vel Notch 1 Out | Inv Iz | Inv Iq Fbk |
| PLL | Noise Amplitude | - | Gain Selection | - | - | - | - |

**Table 8-2 Test Mode I/O**

## 8.5 Test Mode Descriptions

| Test Mode | Description |
|---|---|
| NORMAL | |
| Torque | In this mode, the current in the motor is regulated, but the speed is not. The torque control of the system can be tuned by using white noise as the torque reference and measuring the frequency response of the control loop. A torque offset may be specified, as well as a d-axis current offset. The currents produced by the drive are limited to the current limit of the drive. |
| Rotating Current Vector | In this mode, a rotating current vector is produced. The amplitude and frequency are independently adjustable. The currents produced by the drive are limited to the current limit of the drive. |
| Inner Velocity | In this mode, the inner velocity loop can be tuned by adding white noise to the inner velocity reference. The reference for the inner velocity loop is the sum of the normal velocity reference and the internal white noise source. A d-axis current may also be specified. The outer velocity loop is bypassed. |
| Outer Velocity | In this mode, the outer velocity regulator can be tuned by adding white noise to the outer velocity regulator reference. The reference for the outer velocity loop is the sum of the normal velocity reference and the internal white noise source. |
| Position | In this mode, the position regulator can be tuned by adding white noise to the position reference. An offset can also be specified. The reference for the Position loop is the sum of the internal white noise source and the normal reference. |
| Magnetizing Current | In this mode, the current in the motor is regulated, but the speed is not. The current regulator can be tuned by using white noise as the magnetizing current reference. A current offset may also be specified. The currents produced by the drive are limited to the current limit of the drive. |
| Open-Loop PWM | In this mode, the inverter and converter operate in open loop, i.e. currents are not regulated. The PWM duty cycle of each phase is independently adjustable.<br>***This mode should NEVER be used with voltage on the DC link or damage to the IGBT's may result from uncontrolled output currents!***<br>The PWM duty cycles for inverter X, Y, Z and converter R, S, T phases are obtained from Data Acquisition Tool (DAT) REF 1, 2, and 3, respectively. |
| Converter d-axis Current | In this mode, the converter current regulator can be tuned by adding white noise to the d-axis current reference. The reference for the d-axis converter current regulator is the sum of the normal reference and the internal white noise source. An offset current can also be specified. |

| | |
|---|---|
| Bus Voltage | In this mode, the voltage regulator can be tuned by adding white noise to the bus voltage reference. The reference for the bus voltage regulator is the sum of the normal reference and the internal white noise source. |
| PFC | In this mode, the power factor control (PFC) can be tuned by adding a white noise to the PFC reference. The reference for the PFC is the sum of the internal white noise source and the offset reference. |
| FWC | In this mode, the field weakening control can be tuned by using white noise as the FWC reference. The reference for the FWC is the sum of the internal white noise source and the offset reference. |
| MANUAL | This modes allows the drive to run in a simulated manula mode where the up down buttoms are commanded via the DAT up/down arrows buttoms |
| PROFILE | This test modes tests the drive profile generator where the distance to travel is entered via the SVT engineering menu (Target) in M462. The run command is initiated similar to the MANUAL mode above. |
| Align Magnet | In this test mode the drive applies d-axis current to the motor phases (basically x-phase current while y and z phases half of the current with reversed polarity) to align the magnets with the x-phase such that the locked rotor angle offset MagErr1 MagErr2 in menu 1-8 is calculated to be 0 degrees. This test mode is used to verify the locked rotor test. After application of d-axis current to the motor in this test mode while brake is lifted will result in a locked rotor test result of zero degrees (**MagPos /LRT eDeg**). |
| PLL | This test mode is not DAT initiated test mode. To initiate this test mode the engineering parameter in M(4)62 "Engineering Test" is set to 4001 (4 for inverter, 0 for convertere PWM disabled, 0 for inverter PWM disabled, 1 for PLL test mode). After setting this DAT REF 1 controls noise into the loop. DAT REF3 controls high and low gain selection. Positive entry for DAT REF3 selects high bandwidth gains for the PLL loop while negative entry selects low bandwidth gains. |

# 9 Pre-Defined Motor Parameters

When the parameter Motor Type is set to a pre-defined motor type (other than 901 or 902), the subsequent motor parameters are automatically set as shown in the following table and cannot be modified.

| **Motor Model** | **Gen2 R2** | **Gen2 R2** | **Gen2 R2** | **Gen2 R2** | **Gen2 R2** | **Gen2 R2** | **Gen2 R2** | **Gen2 R2** | **Gen2 R2** |
|---|---|---|---|---|---|---|---|---|---|
| | **1.5T** | **1.5T** | **1.5T** | **2.5T** | **2.5T** | **2.5T** | **2.5T** | **2.5T** | **2.5T** |
| **Otis P/N A*A20220-** | **AV102 AV112 AV121 AV141 AV142 AV151 AV152 AV202 AV212 AV241 AV242 AV251 AV252** | **AV104 AV114 AV122 AV143 AV144 AV153 AV154 AV204 AV214 AV243 AV244 AV253 AV254** | **Proto** | **AK** | **AV301, AV302 AV311, AV312 AV322, AV341 AV342, AV351 AV352, AV372 AV401, AV402 AV407 AV411, AV412 AV422 AV441, AV442 AV446, AV447 AV451, AV452** | **AV303-AV306 AV313-AV316 AV324 AV343 AV344 AV353 AV354 AV374 AV403-AV406 AV408, AV409 AV413-AV416 AV424 AV443, AV444 AV448, AV449 AV453, AV454** | **Proto** | **Proto** | **Proto** |
| **3-1 CONTRACT** | | | | | | | | | |
| Motor Type | **101** | **102** | **191** | **202** | **203** | **204** | **290** | **291** | **293** |
| **3-4 MACHINE** | | | | | | | | | |
| Number of Poles | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| Rated Trq Nm | 106 | 106 | 105 | 165 | 170 | 170 | 165 | 165 | 165 |
| Rated Trq I A | 7.3 | 12 | 13 | 30 | 12.8 | 19.3 | 21 | 28 | 19.4 |
| Ld mH | 112 | 46.5 | 36 | 11.7 | 54.9 | 27.5 | 28 | 11 | 22 |
| Lq mH | 144 | 59 | 45 | 14 | 65.1 | 30.0 | 33 | 11.5 | 30.5 |
| R Ohm | 1 | 0.7 | 1 | 0.7 | 1 | 0.7 | 0.395 | 0.7 | 0.7 |
| T/A Slope % | 23 | 26.89 | 35.4 | 47.8 | 20 | 18.66 | 0 | 0 | 48.0 |
| T/A Offset A | 0 | 1.3 | 5.99 | 12 | 0 | 2.2 | 0 | 0 | 4.7 |
| Kt Slope 1/kNm | 0 | 0 | 2.53 | 1.28 | 0 | 0 | 0 | 0 | 1.25 |
| Id Saturation A | 2.29 | 6.5 | 5 | 20 | 7.4 | 11.0 | 12.5 | 20 | 12 |
| Iq Saturation A | 0 | 0 | 2.5 | 0 | 2.0 | 3.5 | 3.13 | 15 | 0 |
| Ld Slope mH/A | 11.89 | 2.26 | 1.98 | 0.216 | 3.53 | 0.73 | 0.828 | 0.156 | 0.678 |
| Lq Slope mH/A | 7.52 | 1.56 | 1.26 | 0.128 | 2.47 | 0.71 | 0.9 | 0.157 | 0.523 |
| Lq0 mH | 148.3 | 62.7 | 45 | 14 | 87.9 | 37 | 33 | 11.5 | 30.5 |
| Lq1 1/mA | 38.3 | 43.9 | 0 | 0 | 50.9 | 24.3 | 0 | 0 | 0 |
| Lq2 1/mA^2 | 5 | 400 | 0 | 0 | 700 | 200 | 0 | 0 | 0 |
| Ld0 mH | 70.7 | 29 | 36 | 11.7 | 45.4 | 20 | 28 | 11 | 22 |
| Rated Mag I A | - | - | - | - | - | - | - | - | - |
| Peak Mag I A | - | - | - | - | - | - | - | - | - |
| Rtr Time Const s | - | - | - | - | - | - | - | - | - |
| Rated Motor rpm | 371 | 661 | 661 | 661 | 371 | 661 | 377 | 661 | 661 |
| Mag err thr eDeg | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Fld Wkn Lvl % | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Fld Wkn BW Hz | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| **Machine Parameters not in SVT** | | | | | | | | | |
| Turns Per Coil (TPC) | 52 | 33 | 31 | 14 | 30 | 21 | 21 | 14 | 20 |
| Machine Inertia (kg-m$^2$) | 0.109 | 0.109 | 0.109 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 |
| Sheave Diametr (mm) | 103 | 103 | 103 | 103 | 103 | 103 | 103 | 103 | 103 |

| **Motor Model** | **Gen2 R2** | **Gen2 R2** | **Gen2 R2** | **Gen2 R2** | **Gen2 R2** | **Gen2 R2** | | **Test IM** |
|---|---|---|---|---|---|---|---|---|
| **Winding designation: Otis – W# (Kollmorgan letter) Otis machine name** | **5TA** | **5TA** | **W1 (E) 5TA** | **W3 (G/G2/G3) 5TB, C & D** | **W2 (H) 5TB** | **W4 (F/F2/F3) 5TC & D** | **W5 (J) 5TA** | **27KW** |
| **Otis P/N AAA20220- ABA20220 -** | **AN-3SP Proto** | **Proto** | **AS1 AS11 AS21 AS31 AS101 AS122 AS133 AS134** | **AS3, AS13 AS23, AS33 AS51, AS53 AS55 AS61, AS63 AS71, AS73 AS75, AS77 AS81, AS83 AS103 AS136 AS151, AS153 AS155 AS171, AS173 AS175, AS177 AS181, AS183** | **AS2 AS12 AS22 AS32 AS102 AS135** | **AS52, AS54 AS56 AS62, AS64 AS72, AS74 AS76, AS78 AS82, AS84 AS152, AS154 AS156 AS172, AS174 AS176, AS178 AS182, AS184** | **AS5 AS15 AS25 AS26 AS105 AS126 AS131 AS132** | **Proto** |
| **3-1 CONTRACT** | | | | | | | | |
| Motor Type | **391** | **392** | **393** | **394** | **395** | **396** | **398** | **491** |
| **3-4 MACHINE** | | | | | | | | |
| Number of Poles | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 4 |
| Rated Trq Nm | 310 | 310 | 310 | 392 | 394 | 302 | 310 | 129 |
| Rated Trq I A | 63 | 33.9 | 30 | 41 | 32.3 | 39 | 16.9 | 57 |
| Ld mH | 6.5 | 21 | 28 | 15 | 21.8 | 10.2 | 69 | 1 |
| Lq mH | 8.5 | 27 | 40 | 22 | 35.7 | 14.5 | 85.8 | 1 |
| R Ohm | 0.7 | 0.8 | 0.6 | 0.3 | 0.3 | 0.3 | 0.8 | 1 |
| T/A Slope % | 37.4 | 56.7 | 51.45 | 31.9 | 32.1 | 33.82 | 46.5 | - |
| T/A Offset A | 12 | 15 | 9 | 2 | 1.4 | 10 | 5 | - |
| Kt Slope 1/kNm | 0 | 0.69 | 0.57 | 0.65 | 0.57 | 0.84 | 0 | - |
| Id Saturation A | 10 | 10 | 5 | 15 | 7 | 15 | 5 | - |
| Iq Saturation A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - |
| Ld Slope mH/A | 0.105 | 0.465 | 0.629 | 0.22 | 0.47 | 0.18 | 2.8 | - |
| Lq Slope mH/A | 0.042 | 0.247 | 0.343 | 0.19 | 0.35 | 0.11 | 1.31 | - |
| Lq0 mH | 8.5 | 33.1 | 69 | 38 | 45.2 | 19 | 121.5 | 1 |
| Lq1 1/mA | 0 | 10.69 | 34.7 | 28 | 28.7 | 14.5 | 33.9 | 10 |
| Lq2 1/mA^2 | 0 | 38.33 | 138.8 | 100 | 200 | 60 | 200 | 20 |
| Ld0 mH | 6.5 | 21 | 20 | 11 | 23 | 9.5 | 50 | 1 |
| Rated Mag I A | - | - | - | - | - | - | - | 22.4 |
| Peak Mag I A | - | - | - | - | - | - | - | 50 |
| Rtr Time Const s | - | - | - | - | - | - | - | 0.28 |
| Rated Motor rpm | 576 | 576 | 576 | 648 | 518 | 822 | 324 | 1489 |
| Mag err thr eDeg | 20 | 20 | 20 | 20 | 20 | 20 | 20 | - |
| Fld Wkn Lvl % | 100 | 100 | 100 | 100 | 100 | 100 | 100 | - |
| Fld Wkn BW Hz | 10 | 10 | 10 | 10 | 10 | 10 | 10 | - |
| **Machine Parameters not in SVT** | | | | | | | | |
| Turns Per Coil (TPC) | 20 | 36 | 17 | 12 | 15 | 10 | 30 | ? |
| Machine Inertia (kg-m$^2$) | 0.4 | 0.4 | 0.4 | 0.48 | 0.48 | 0.4 | 0.4 | 0.25 |
| Sheave Diametr (mm) | 118 | 118 | 118 | 118 | 118 | 118 | 118 | - |

Note 1: Set to 902 for the user defined motor type and enter parameters in menu 3-4 since a predefined motor type does not yet exist in the software baseline for this machine.

| Motor Model | Blue light | Blue light | Blue light | Blue light | Blue light | Gen2 R2 |
|---|---|---|---|---|---|---|
| | 3T | 3T | 5T | 6T | 6T | 5T |
| Otis P/N DAA20220- | B17 | B19 | C1 | D3 | D1 | Proto |
| **3-1 CONTRACT** | | | | | | |
| Motor Type | **205** | **206** | **301** | **401** | **402** | **397** |
| **3-4 MACHINE** | | | | | | |
| Number of Poles | 20 | 20 | 20 | 20 | 20 | 8 |
| Rated Trq Nm | 665 | 665 | 700 | 1280 | 1280 | 310 |
| Rated Trq I A | 11.5 | 21.3 | 29.7 | 31.8 | 48.1 | 66 |
| Ld mH | 116 | 35.6 | 26.5 | 36.8 | 17.9 | 3.62 |
| Lq mH | 105 | 32.6 | 21 | 32.9 | 17 | 5.2 |
| R Ohm | 4.95 | 1.65 | 0.92 | 0.62 | 0.32 | 0.6 |
| T/A Slope % | 29.1 | 16 | 23 | 21.5 | 24 | 25.3 |
| T/A Offset A | 2 | 4 | 6 | 6 | 10 | 2 |
| Kt Slope 1/kNm | 0 | 0 | 0 | 0 | 0 | 0 |
| Id Saturation A | 10 | 15 | 35 | 30 | 30 | 20 |
| Iq Saturation A | 3 | 15 | 30 | 25 | 30 | 0 |
| Ld Slope mH/A | 3.55 | 1.2 | 0.37 | 0.48 | 0.22 | 0.03 |
| Lq Slope mH/A | 0.91 | 0.23 | 0.2 | 0.25 | 0.07 | 0.01 |
| Lq0 mH | 105 | 32.6 | 19.2 | 35.1 | 18 | 8.3 |
| Lq1 1/mA | 0 | 0 | 0 | 0 | 0 | 11.1 |
| Lq2 1/mA^2 | 0 | 0 | 0 | 0 | 0 | 20 |
| Ld0 mH | 85 | 26 | 18.58 | 23.17 | 12 | 3.62 |
| Rated Mag I A | - | - | - | - | - | - |
| Peak Mag I A | - | - | - | - | - | - |
| Rtr Time Const s | - | - | - | - | - | - |
| Rated Motor rpm | 96 | 168 | 234 | 139 | 199 | 809 |
| Mag err thr eDeg | 20 | 20 | 20 | 20 | 20 | 20 |
| Fld Wkn Lvl % | 100 | 100 | 100 | 100 | 100 | 100 |
| Fld Wkn BW Hz | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 |
| **Machine Parameters not in SVT** | | | | | | |
| Turns Per Coil (TPC) | | | | | | ? |
| Machine Inertia (kg-m$^2$) | | | | | | ? |
| Sheave Diametr (mm) | | | | | | 118 |

| Motor Model | Reivaj | Reivaj | Reivaj | Test Motor at Jabil | Gen2 Green Power (GGP) Vector 630kg 1.0m/s | Gen2 Green Power (GGP) Vector 1000kg 1.0m/s | Gen2 Green Power (GGP) Comfort 630kg 1.75m/s | Gen2 Green Power (GGP) Premier 630kg 1.0m/s | Gen2 Green Power (GGP) Premier 630kg 1.75m/s |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| **Otis P/N *AA20220-** | TAA | **T_A 20220 S101 S111 S121 S501 S521 S251 S551 S571** | **TAA** | **-** | **TAA202 20Z1 Z6 Z7** | **TAA202 20Z11 Z16 Z17** | **TAA202 20X201 X251 X252 X253 X551 X571 AX1 AX2** | **TAA202 20AJ1 AJ2 AJ502 AJ3 AJ503 AJ4 AJ504** | **TAA202 20AJ11 AJ12 AJ512 AJ13 AJ513 AJ14 AJ514** |
| **3-1 CONTRACT** | | | | | | | | | |
| Motor Type | **520** | **521** | **522** | **292** | **103** | **104** | **105** | **208** | **209** |
| **3-4 MACHINE** | | | | | | | | | |
| Number of Poles | **10** | 10 | 10 | 4 | 10 | 10 | 10 | 10 | 10 |
| Rated Trq Nm | **45** | 63.4 | 83.3 | 70 | 59.3 | 77.8 | 83.3 | 106.6 | 106.6 |
| Rated Trq I A | **7.48** | 10.6 | 14.12 | 30 | 6.65 | 7.4 | 14 | 7.6 | 13.6 |
| Ld mH | **30** | 43.2 | 17 | 10.0 | 108 | 105 | 36 | 108 | 40 |
| Lq mH | 62 | 55.3 | 36 | 10.0 | 146 | 150 | 46 | 147 | 53 |
| R Ohm | 3.7 | 2.5 | 1.58 | 0.7 | 7.7 | 5.1 | 1.8 | 5.5 | 1.9 |
| T/A Slope % | 40 | 36.6 | 21 | 0 | 0 | 30 | 0 | 65 | 40 |
| T/A Offset A | 0.0 | 3.5 | 0.0 | 0 | 0 | 0 | 0 | 6 | 8 |
| Kt Slope 1/kNm | 0.0 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Id Saturation A | 0.0 | 4.4 | 0.0 | 0.0 | 2.2 | 0 | 6 | 2.2 | 4 |
| Iq Saturation A | 4.0 | 2.3 | 2.8 | 0.0 | 1.5 | 3.5 | 1 | 1.9 | 2.8 |
| Ld Slope mH/A | 0.0 | 1.37 | 0.0 | 0.0 | 4.6 | 0 | 1.2 | 5.9 | 1.5 |
| Lq Slope mH/A | 3.076 | 1.78 | 1.305 | 0.0 | 9.4 | 4.5 | 1.15 | 6.3 | 1.28 |
| Lq0 mH | 62 | 55.3 | 36 | 10 | 146 | 150 | 46 | 147 | 53 |
| Lq1 1/mA | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lq2 1/mA^2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ld0 mH | 30 | 43.2 | 17 | 10 | 98 | 105 | 36 | 86 | 32 |
| Rated Mag I A | - | - | - | 12 | - | - | - | - | - |
| Peak Mag I A | - | - | - | 20 | - | - | - | - | - |
| Rtr Time Const s | - | - | - | - | - | - | - | - | - |
| Rated Motor rpm | 480 | 477 | 480 | 1000 | 477 | 477 | 835 | 371 | 649 |
| Mag err thr eDeg | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Fld Wkn Lvl % | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Fld Wkn BW Hz | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| **Machine Parameters not in SVT** | | | | | | | | | |
| Turns Per Coil (TPC) | | | | | | | | | |
| Machine Inertia (kg-m$^2$) | | | | | | | | | |
| Sheave Diametr (mm) | | | | | | | | | |

| **Motor Model** | **PM138** | **PM138** | **PM138** | **PM138** | **PM138** | **PM138** |
|---|---|---|---|---|---|---|
| | Type1-J | Type2-J | Type2A-J | Type1-C | Type2-C | Type2A-C |
| **Otis P/N J_A20227___-** | **AAG 1-99** | **AAA 1-99** | **AAJ 1-99** | **AAG 101-** | **AAA 101-** | **AAJ 101-** |
| **3-1 CONTRACT** | | | | | | |
| Motor Type | **711** | **712** | **713** | **714** | **715** | **716** |
| **3-2 ADJUSTMENT** | | | | | | |
| Track Error mm/s | 150 | 150 | 150 | 150 | 150 | 150 |
| No Enc VThrs PU | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| No enc flt t sec | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |
| **3-3 BRAKE** | | | | | | |
| Brk Pick A | 4.03 | 4.03 | 4.03 | 4.03 | 4.03 | 4.03 |
| Brk Pick % | 85 | 85 | 85 | 85 | 85 | 85 |
| Brk Hold A | 1.94 | 1.94 | 1.94 | 1.94 | 1.94 | 1.94 |
| Brk OCT A | 7 | 7 | 7 | 7 | 7 | 7 |
| Brk R ohm | 31 | 31 | 31 | 31 | 31 | 31 |
| Brk L H | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Brk I bw pick Hz | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| Brk I bw hold Hz | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| **3-4 MACHINE** | | | | | | |
| Number of Poles | 24 | 24 | 24 | 24 | 24 | 24 |
| Rated Trq Nm | 1107 | 1470 | 1303 | 1107 | 1470 | 1303 |
| Rated Trq I A | 62.9 | 81 | 95.9 | 62.9 | 81 | 95.9 |
| Ld mH | 5.5 | 2.6 | 1.98 | 4.8 | 3.9 | 2.3 |
| Lq mH | 4.9 | 4.1 | 2.3 | 4.65 | 3.85 | 2.22 |
| R Ohm | 0.16 | 0.153 | 0.05 | 0.25 | 0.2 | 0.15 |
| T/A Slope % | 0 | 0 | 0 | 0 | 0 | 0 |
| T/A Offset A | 0 | 0 | 0 | 0 | 0 | 0 |
| Kt Slope 1/kNm | 0 | 0 | 0 | 0 | 0 | 0 |
| Id Saturation A | 55 | 65 | 65 | 45 | 55 | 70 |
| Iq Saturation A | 65 | 65 | 65 | 22 | 10 | 20 |
| Ld Slope **uH/A** | 17 | 3.1 | 2.8 | 18 | 11.3 | 5.7 |
| Ld Slope mH/A | 0.02 | 0 | 0 | 0.02 | 0.01 | 0.01 |
| Lq Slope **uH/A** | 9.5 | 6.9 | 3.0 | 7.5 | 4.1 | 1.3 |
| Lq Slope mH/A | 0.01 | 0.01 | 0 | 0.01 | 0 | 0 |
| Lq0 mH | 4.9 | 4.1 | 2.3 | 4.65 | 3.85 | 2.22 |
| Lq1 1/mA | 0 | 0 | 0 | 0 | 0 | 0 |
| Lq2 1/mA^2 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ld0 mH | 5.5 | 2.6 | 1.98 | 4.8 | 3.9 | 2.3 |
| Rated Motor rpm | 255 | 255 | 255 | 255 | 255 | 255 |
| Mag err thr eDeg | 20 | 20 | 20 | 20 | 20 | 20 |
| LRT AC Level PU | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 |
| LRT DC Level PU | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| LRT mot err eDeg | 8 | 8 | 8 | 8 | 8 | 8 |
| Fld Wkn Lvl % | 100 | 100 | 100 | 100 | 100 | 100 |
| Fld Wkn BW Hz | 10 | 10 | 10 | 10 | 10 | 10 |
| **Machine Parameters not in SVT** | | | | | | |
| Turns Per Coil (TPC) | 69 | 57 | 43 | 69 | 57 | 43 |
| Machine Inertia (kg-m$^2$) | 22 | 22 | 22 | 23 | 23 | 23 |
| Sheave Diametr (mm) | 600 | 600 | 600 | 600 | 600 | 600 |

| **Motor Model** | **BOMCO3** | **BOMCO3** | **BOMCO3** | **BOMCO3** | **BOMCO3** | **BOMCO3** |
|---|---|---|---|---|---|---|
| **Brake** | Any brake | ANSI 3 brakes | ANSI 4 brakes | ANSI 5 brakes | EN 3 brakes | EN 4 brakes |
| **Otis P/N J_A20227___-** | **D_A 20220 AK** | | | | | |
| **3-1 CONTRACT** | | | | | | |
| Motor Type | **721** | **723** | **724** | **725** | **726** | **727** |
| **3-3 BRAKE** | | | | | | |
| Brk Pick A | --- | 6.75 | 9.00 | 11.25 | 7.76 | 10.35 |
| Brk Pick % | --- | 85 | 85 | 85 | 85 | 85 |
| Brk Hold A | --- | 3.3 | 4.4 | 5.5 | 3.8 | 5.1 |
| Brk OCT A | --- | 10 | 12 | 15 | 11 | 14 |
| Brk R ohm | --- | 11.3 | 8.5 | 6.8 | 5.5 | 4.1 |
| Brk L H | --- | 1.2 | 0.9 | 0.7 | 0.73 | 0.55 |
| Brk I bw pick Hz | --- | 2 | 2 | 2 | 2 | 2 |
| Brk I bw hold Hz | --- | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| **3-4 MACHINE** | | | | | | |
| Number of Poles | 30 | 30 | 30 | 30 | 30 | 30 |
| Rated Trq Nm | 1750 | 1750 | 1750 | 1750 | 1750 | 1750 |
| Rated Trq I A | 79.2 | 79.2 | 79.2 | 79.2 | 79.2 | 79.2 |
| Ld mH | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 |
| Lq mH | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 |
| R Ohm | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 |
| T/A Slope % | 0 | 0 | 0 | 0 | 0 | 0 |
| T/A Offset A | 0 | 0 | 0 | 0 | 0 | 0 |
| Kt Slope 1/kNm | 0 | 0 | 0 | 0 | 0 | 0 |
| Id Saturation A | 0 | 0 | 0 | 0 | 0 | 0 |
| Iq Saturation A | 50 | 50 | 50 | 50 | 50 | 50 |
| Ld Slope **uH/A** | 23 | 23 | 23 | 23 | 23 | 23 |
| Lq Slope **uH/A** | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 |
| Lq0 mH | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 |
| Lq1 1/mA | 0 | 0 | 0 | 0 | 0 | 0 |
| Lq2 1/mA^2 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ld0 mH | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 |
| Rated Motor rpm | 255 | 255 | 255 | 255 | 255 | 255 |
| Mag err thr eDeg | 20 | 20 | 20 | 20 | 20 | 20 |
| LRT AC Level PU | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 |
| LRT DC Level PU | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| LRT mot err eDeg | 8 | 8 | 8 | 8 | 8 | 8 |
| Fld Wkn Lvl % | 100 | 100 | 100 | 100 | 100 | 100 |
| Fld Wkn BW Hz | 10 | 10 | 10 | 10 | 10 | 10 |
| **Parameters not in SVT** | | | | | | |
| Sheave Diametr (mm) | 600 | | | | | |

| Motor Model | PM30T | PM30T | PM30T | PM30T |
|---|---|---|---|---|
| | Type1 -Std | Type1 -ANSI | Type2 -Std | Type2 -ANSI |
| Otis P/N J_A20226___- | AAH 1,2 ABK 1,2,5,6 | ABK 1,2,5,6 | AAH 3,4 ABK 3,4,7,8 | ABK 3,4,7,8 |
| Brake P/N | J_A20237AAG | J_A20237AAK | J_A20237AAG | J_A20237AAK |
| **3-1 CONTRACT** | | | | |
| Motor Type | 731 | 732 | 733 | 734 |
| **3-2 ADJUSTMENT** | | | | |
| Track Error mm/s | 150 | 150 | 150 | 150 |
| No Enc VThrs PU | 0.2 | 0.2 | 0.2 | 0.2 |
| No enc flt t sec | 0.4 | 0.4 | 0.4 | 0.4 |
| **3-3 BRAKE** | | | | |
| Brk Pick A | 4.23 | 4.1 | 4.23 | 4.1 |
| Brk Pick % | 85 | 85 | 85 | 85 |
| Brk Hold A | 3.52 | 3.4 | 3.52 | 3.4 |
| Brk OCT A | 10 | 10 | 10 | 10 |
| Brk R ohm | 24.1 | 27 | 24.1 | 27 |
| Brk L H | 2.3 | 2.5 | 2.3 | 2.5 |
| Brk I bw pick Hz | 8 | 8 | 8 | 8 |
| Brk I bw hold Hz | 1 | 1 | 1 | 1 |
| **3-4 MACHINE** | | | | |
| Number of Poles | 36 | 36 | 36 | 36 |
| Rated Trq Nm | 3724 | 3724 | 4655 | 4655 |
| Rated Trq I A | 131.9 | 131.9 | 160.0 | 160.0 |
| Ld mH | 2.02 | 2.02 | 1.7 | 1.7 |
| Lq mH | 2.11 | 2.11 | 1.72 | 1.72 |
| R Ohm | 0.15 | 0.15 | 0.13 | 0.13 |
| T/A Slope % | 0 | 0 | 0 | 0 |
| T/A Offset A | 0 | 0 | 0 | 0 |
| Kt Slope 1/kNm | 0 | 0 | 0 | 0 |
| Id Saturation A | 65 | 65 | 0 | 0 |
| Iq Saturation A | 86 | 86 | 80 | 80 |
| Ld Slope **uH/A** | 2.6 | 2.6 | 3 | 3 |
| Ld Slope mH/A | 0 | 0 | 0 | 0 |
| Lq Slope **uH/A** | 1.6 | 1.6 | 0.9 | 0.9 |
| Lq Slope mH/A | 0 | 0 | 0 | 0 |
| Lq0 mH | 2.11 | 2.11 | 1.72 | 1.72 |
| Lq1 1/mA | 0 | 0 | 0 | 0 |
| Lq2 1/mA^2 | 0 | 0 | 0 | 0 |
| Ld0 mH | 2.02 | 2.02 | 1.7 | 1.7 |
| Rated Motor rpm | 176 | 176 | 176 | 176 |
| Mag err thr eDeg | 20 | 20 | 20 | 20 |
| LRT AC Level PU | 0.09 | 0.09 | 0.09 | 0.09 |
| LRT DC Level PU | 0.15 | 0.15 | 0.15 | 0.15 |
| LRT mot err eDeg | 8 | 8 | 8 | 8 |
| Fld Wkn Lvl % | 100 | 100 | 100 | 100 |
| Fld Wkn BW Hz | 10 | 10 | 10 | 10 |
| **Machine Parameters not in SVT** | | | | |
| Turns Per Coil (TPC) | 46 | 46 | 38 | 38 |
| Machine Inertia (kg-m$^2$) | 84.2 | 84.2 | 88.7 | 88.7 |
| Sheave Diametr (mm) | 760 | 760 | 760 | 760 |

| **Motor Model** | **156MST** | **156MST** | | |
|---|---|---|---|---|
| | **1800kg-4mps 480V** | **1800kg-4mps 480V** | | |
| **Otis P/N** | **Shibayama test** | **JAA20220 AAL/AAP** | | |
| **3-1 CONTRACT** | | | | |
| Motor Type | **791** | **792** | | |
| **3-3 BRAKE** | | | | |
| Brk Pick A | - | 5.3 | | |
| Brk Pick % | - | 85 | | |
| Brk Hold A | - | 2.8 | | |
| Brk OCT A | - | 8 | | |
| Brk R ohm | - | 25.0 | | |
| Brk L H | - | 4.0 | | |
| Brk I bw pick Hz | - | 1.5 | | |
| Brk I bw hold Hz | - | 0.5 | | |
| **3-4 MACHINE** | | | | |
| Number of Poles | 8 | 8 | | |
| Rated Trq Nm | 1530 | 1333 | | |
| Rated Trq I A | 102 | 66 | | |
| Ld mH | 1.8 | 3.8 | | |
| Lq mH | 1.8 | 3.8 | | |
| R Ohm | 1.0 | 0.7 | | |
| Rated Mag I A | 60 | 54 | | |
| Peak Mag I A | 60 | 55 | | |
| Rtr Time Const s | 0.55 | 0.55 | | |
| Max Flux time s | 1 | 1 | | |
| Rated Motor rpm | 250 | 250 | | |
| **Parameters not in SVT** | | | | |
| Turns Per Coil (TPC) | - | - | | |
| Machine Inertia (kg-m$^2$) | - | - | | |
| Sheave Diametr (mm) | 610 | 610 | | |

| Motor Model | 41T-514x2 | 41T-514x2 | 41T-526x2 | 41T-526x2 |
|---|---|---|---|---|
| | 2brakes<br>8mps<br>3phase | 4brakes<br>8mps<br>3phase | 2brakes<br>15mps<br>6phase | 4brakes<br>15mps<br>6phase |
| **3-1 CONTRACT** | | | | |
| Motor Type | **801** | **802** | **803** | **804** |
| **3-2 ADJUSTMENT** | | | | |
| Track Error mm/s | --- | --- | --- | --- |
| No Enc VThrs PU | --- | --- | --- | --- |
| No enc flt t sec | --- | --- | --- | --- |
| **3-3 BRAKE** | | | | |
| Brk Pick A | 7.4 | 7.4 | 7.4 | 7.4 |
| Brk Pick % | 85 | 85 | 85 | 85 |
| Brk Hold A | 3.0 | 3.0 | 3.0 | 3.0 |
| Brk OCT A | 10 | 10 | 10 | 10 |
| Brk R ohm | 14.4 | 28.8 | 14.4 | 28.8 |
| Brk L H | 0.2 | 0.2 | 0.2 | 0.2 |
| Brk I bw pick Hz | 1 | 1 | 1 | 1 |
| Brk I bw hold Hz | 0.2 | 0.2 | 0.2 | 0.2 |
| **3-4 MACHINE** | | | | |
| Number of Poles | 48 | 48 | 48 | 48 |
| Rated Trq Nm | 16850 | 16850 | 16850 | 16850 |
| Rated Trq I A | 413 | 413 | 800 | 800 |
| Ld mH | 1.2 | 1.2 | 0.8 | 0.8 |
| Lq mH | 1.4 | 1.4 | 0.78 | 0.78 |
| R Ohm | 0.05 | 0.05 | 0.03 | 0.03 |
| T/A Slope % | 0 | 0 | 0 | 0 |
| T/A Offset A | 0 | 0 | 0 | 0 |
| Kt Slope 1/kNm | 0 | 0 | 0 | 0 |
| Id Saturation A | 0 | 0 | 50 | 50 |
| Iq Saturation A | 0 | 0 | 200 | 200 |
| Ld Slope **uH/A** | 0 | 0 | 0.8 | 0.8 |
| Lq Slope **uH/A** | 0 | 0 | 0.1 | 0.1 |
| Lq0 mH | 1.4 | 1.4 | 0.82 | 0.82 |
| Lq1 1/mA | 0 | 0 | 0 | 0 |
| Lq2 1/mA^2 | 0 | 0 | 0 | 0 |
| Ld0 mH | 1.2 | 1.2 | 0.6 | 0.6 |
| Rated Motor rpm | 139 | 139 | 260 | 260 |
| Mag err thr eDeg | 20 | 20 | 25 | 25 |
| LRT AC Level PU | 0.03 | 0.03 | 0.03 | 0.03 |
| LRT DC Level PU | 0.5 | 0.5 | 0.5 | 0.5 |
| LRT mot err eDeg | 8 | 8 | 8 | 8 |
| Fld Wkn Lvl % | 100 | 100 | 100 | 100 |
| Fld Wkn BW Hz | 2.5 | 2.5 | 2.5 | 2.5 |
| **Machine Parameters not in SVT** | | | | |
| Turns Per Coil (TPC) | | | | |
| Machine Inertia (kg-m$^2$) | | | | |
| Sheave Diametr (mm) | 1110 | 1110 | 1110 | 1110 |

| **Motor Model** | Gen2 Green Power (GGP) Comfort 630kg 1.0m/s | Gen2 Green Power (GGP) Comfort 1000kg 1.0m/s | Gen2 Green Power (GGP) Comfort 1000kg 1.6/1.75 m/s | | 2.6T-54X1 | 2.6T-54X2 | 2.6T-57X1 | 2.6T-57X2 | 2.6T-58x1 | 3.2T-54X3 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Otis P/N** | T_A 20220 S252 S552 S253 S572 | T_A 20220 V251 V255 V551 V571 V574 | TAA202 20 V256 | AAA202 20AW 71 & 81 | T_A 20220 AB7 AB5 AB505 AB15 AB515 AB25 AB525 | T_A 20220 AB2 AB502 AB12 AB512 AB22 AB522 | T_A 20220 AB6 AB1 AB501 AB11 AB511 AB21 AB521 | T_A 20220 AB3 AB503 AB13 AB513 AB23 AB523 | T_A 20220 AB562 | T_A 20220 AB4 AB504 AB14 AB514 AB24 AB524 |
| **3-1 CONTRACT** | | | | | | | | | | |
| Motor Type | **201** | **207** | **210** | **302** | **211** | **212** | **213** | **214** | **215** | **303** |
| **3-4 MACHINE** | | | | | | | | | | |
| Number of Poles | 10 | 10 | 10 | 10 | 14 | 14 | 14 | 14 | 14 | 14 |
| Rated Trq Nm | 83.3 | 126.0 | 126.0 | 210 | 160 | 200 | 160 | 200 | 200 | 255 |
| Rated Trq I A | 7.8 | 13.60 | 22.5 | 19.5 | 12.2 | 13.4 | 19.4 | 25 | 28.8 | 17.1 |
| Ld mH | 87 | 62.92 | 22 | 52.00 | 45 | 41 | 14 | 13 | 8.2 | 32 |
| Lq mH | 110 | 78.22 | 28 | 67.00 | 70 | 48.5 | 17 | 17 | 11.6 | 41 |
| R Ohm | 5 | 1.25 | 1.4 | 3.00 | 3 | 3 | 2 | 2 | 0.4 | 3 |
| T/A Slope % | 35 | 27.91 | 44 | 41.3 | 22.9 | 76.5 | 43.8 | 47 | 22.5 | 33 |
| T/A Offset A | 2.57 | 2.90 | 9 | 0.99 | 3.7 | 12 | 13.5 | 15 | 9.9 | 7.5 |
| Kt Slope 1/kNm | 0 | 0.00 | 0 | 0.00 | 0 | 0 | 0 | 0 | 0 | 0 |
| Id Saturation A | 4 | 3.0 | 0.0 | 6.00 | 2.2 | 5 | 9 | 8 | 7.5 | 9 |
| Iq Saturation A | 3 | 1.50 | 6.3 | 0.00 | 2.4 | 5 | 9 | 5 | 6.0 | 5 |
| Ld Slope mH/A | 3.09 | 0.46 | 0.00 | 2.43 | 1.80 | 0.94 | 0.27 | 0.21 | 0.09 | 0.74 |
| Lq Slope mH/A | 4.8 | 2.66 | 0.55 | 1.36 | 1.95 | 0.87 | 0.21 | 0.19 | 0.11 | 0.6 |
| Lq0 mH | 118.54 | 111.9 | 36 | 90.0 | 70 | 48.5 | 17 | 17 | 11.6 | 41 |
| Lq1 1/mA | 43.25 | 56 | 0 | 36 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lq2 1/mA^2 | 0 | 900 | 0 | 300 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ld0 mH | 58.0 | 56.14 | 22 | 40.00 | 45 | 41 | 5 | 5 | 8.2 | 32 |
| Rated Mag I A | - | - | - | - | - | - | - | - | - | - |
| Peak Mag I A | - | - | - | - | - | - | - | - | - | - |
| Rtr Time Const s | - | - | - | - | - | - | - | - | - | - |
| Rated Motor rpm | 477 | 477 | 835 | 371 | 371 | 378 | 649 | 660 | 818 | 378 |
| Mag err thr eDeg | 20 | 20.00 | 20.00 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Fld Wkn Lvl % | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Fld Wkn BW Hz | 10 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 |
| **Machine Parameters not in SVT** | | | | | | | | | | |
| Turns Per Coil (TPC) | | | | | | | | | | |
| Machine Inertia (kg-m$^2$) | | | | | | | | | | |
| Sheave Diametr (mm) | | | | | | | | | | |

| **Motor Model** | **2.6T at 3 m/s 2.6T-5198F** | **5.2T5195D** |
|---|---|---|
| **Otis P/N** | TAA20220 AB566_3m/s | TAA20220AT41 AT43 |
| **3-1 CONTRACT** | | |
| Motor Type | **216** | **511** |
| **3-4 MACHINE** | | |
| Number of Poles | 14 | 14 |
| Rated Trq Nm | 200 | 356 |
| Rated Trq I A | 34.7 | 59.7 |
| Ld mH | 5.2 | 4.4 |
| Lq mH | 6.8 | 5.8 |
| R Ohm | 0.2 | 0.1 |
| T/A Slope % | 24.2 | 26.6 |
| T/A Offset A | 13.3 | 18.5 |
| Kt Slope 1/kNm | 0 | 0 |
| Id Saturation A | 14.5 | 7.3 |
| Iq Saturation A | 14 | 18 |
| Ld Slope mH/A | 0.04 | 0.03 |
| Lq Slope mH/A | 0.04 | 0.03 |
| Lq0 mH | 6.8 | 5.8 |
| Lq1 1/mA | 0 | 0 |
| Lq2 1/mA^2 | 0 | 0 |
| Ld0 mH | 5.2 | 4.4 |
| Rated Motor rpm | 982 | 945 |
| Mag err thr eDeg | | |
| Fld Wkn Lvl % | | |
| Fld Wkn BW Hz | | |

| **Motor Model** | 4.1T-53X1 | 4.1T-56X1 | 5.0T-53X2 | 5.0T-56X2 | 5.2T-54X1 | 5.2T – 58x1 | 5.2T – 58x2 |
|---|---|---|---|---|---|---|---|
| **Otis P/N** | A*A 20220 BD1 BE1 | A*A 20220 BD11 BE11 | A*A 20220 BD21 BE21 | A*A 20220 BD31 BD32 BE31 | A*A 20220 BF12 | A*A 20220 BF1 BF11 BG1 | A*A 20220 BF21 BG11 |
| **3-1 CONTRACT** | | | | | | | |
| Motor Type | **403** | **404** | **501** | **502** | **505** | **503** | **504** |
| **3-4 MACHINE** | | | | | | | |
| Number of Poles | 14 | 14 | 14 | 14 | 14 | 14 | 14 |
| Rated Trq Nm | 300 | 300 | 420 | 420 | 300 | 300 | 365 |
| Rated Trq I A | 16 | 28 | 21.7 | 36.2 | 34 | 37 | 50 |
| Ld mH | 52 | 20 | 44 | 15.5 | 42 | 9.5 | 6.5 |
| Lq mH | 60 | 29 | 73 | 20 | 59 | 12.3 | 8.75 |
| R Ohm | 0.8 | 0.8 | 0.7 | 1.6 | 0.35 | 1 | 0.35 |
| T/A Slope % | 37.4 | 40 | 37 | 39 | 39.7 | 40.6 | 34 |
| T/A Offset A | 4.8 | 9.5 | 7.39 | 11.6 | 5.78 | 13.4 | 19 |
| Kt Slope 1/kNm | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Id Saturation A | 3 | 7 | 3.4 | 5 | 5 | 10 | 15 |
| Iq Saturation A | 16 | 5 | 4 | 5.3 | 5 | 11.1 | 5 |
| Ld Slope mH/A | 0.9 | 0.2 | 0.7 | 0.17 | 0.8 | 0.1 | 0.04 |
| Lq Slope mH/A | 0.5 | 0.33 | 1 | 0.18 | 1.15 | 0.12 | 0.07 |
| Lq0 mH | 75 | 32 | 73.8 | 22 | 65 | 11 | 11 |
| Lq1 1/mA | 0 | 0 | 0 | 0 | 1.59 | 0 | 0 |
| Lq2 1/mA^2 | 0 | 0 | 0 | 0 | 0.02 | 0 | 0 |
| Ld0 mH | 60 | 10 | 35.6 | 10 | 45 | 6.5 | 4.8 |
| Rated Mag I A | - | - | - | - | - | - | - |
| Peak Mag I A | - | - | - | - | - | - | - |
| Rtr Time Const s | - | - | - | - | - | - | - |
| Rated Motor rpm | 330 | 576 | 330 | 576 | 405 | 822 | 822 |
| Mag err thr eDeg | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Fld Wkn Lvl % | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Fld Wkn BW Hz | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 |
| **Machine Parameters not in SVT** | | | | | | | |
| Turns Per Coil (TPC) | | | | | | | |
| Machine Inertia (kg-m$^2$) | | | | | | | |
| Sheave Diametr (mm) | | | | | | | |

| MACHRAT | GGP<br>4.1T532D<br>4.1T533D | GGP<br>4.1T558E<br>3.2T558 | GGP<br>4.1T581A<br>4.1T582A | GGP<br>5.0T532A<br>5.0T533A | GGP<br>5.0T552A | GGP<br>5.0T557B<br>5.0T558B | GGP<br>5.2T581C<br>5.2T582C |
|---|---|---|---|---|---|---|---|
| | 1600kg<br>1.02m/s | 1600kg<br>1.78m/s | 1600kg<br>2.54m/s | 2268kg<br>1.02m/s | 2000kg<br>1.60m/s | 2268kg<br>1.78m/s | 2268kg<br>2.54m/s |
| **Otis P/N** | TA*20220<br>AR11 | TA*20220<br>AR12 | TA*20220<br>AT11 | TA*20220<br>AT12 | TA*20220<br>AT13 | TA*20220<br>AT14<br>AT15 | TA*20220<br>AT32 |
| **3-1 CONTRACT** | | | | | | | |
| Motor Type | **405** | **406** | **407** | **507** | **508** | **509** | **510** |
| **3-4 MACHINE** | | | | | | | |
| Number of Poles | 14 | 14 | 14 | 14 | 14 | 14 | 14 |
| Rated Trq Nm | 300 | 300 | 300 | 435 | 375 | 420 | 410 |
| Rated Trq I A | 18.2 | 32 | 44 | 26.3 | 35.5 | 43.6 | 62 |
| Ld mH | 39.4 | 16.5 | 7.5 | 46.9 | 18.3 | 14.7 | 5.3 |
| Lq mH | 52.0 | 22.8 | 10.2 | 64.8 | 27.3 | 19.7 | 7.4 |
| R Ohm | 1.57 | 0.7 | 0.18 | 1.0 | 0.42 | 0.31 | 0.11 |
| T/A Slope % | 38.1 | 32.3 | 32.9 | 42.3 | 35 | 25.7 | 27.4 |
| T/A Offset A | 6.2 | 8.9 | 15.1 | 7.1 | 9 | 9.2 | 17.1 |
| Kt Slope 1/kNm | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Id Saturation A | 6.1 | 7 | 7.3 | 11.5 | 3 | 3 | 7.5 |
| Iq Saturation A | 4.4 | 7 | 17.2 | 6.2 | 3.6 | 12.3 | 5.0 |
| Ld Slope mH/A | 0.67 | 0.17 | 0.06 | 0.61 | 0.32 | 0.20 | 0.04 |
| Lq Slope mH/A | 0.8 | 0.23 | 0.09 | 1.00 | 0.27 | 0.22 | 0.03 |
| Lq0 mH | 52.0 | 22.8 | 10.2 | 64.8 | 27.3 | 19.7 | 7.4 |
| Lq1 1/mA | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lq2 1/mA^2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ld0 mH | 39.4 | 16.5 | 7.5 | 46.9 | 18.3 | 14.7 | 5.3 |
| Rated Mag I A | - | - | - | - | - | - | - |
| Peak Mag I A | - | - | - | - | - | - | - |
| Rtr Time Const s | - | - | - | - | - | - | - |
| Rated Motor rpm | 324 | 576 | 809 | 330 | 518 | 576 | 822 |
| Mag err thr eDeg | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Fld Wkn Lvl % | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Fld Wkn BW Hz | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 |
| **Machine Parameters not in SVT** | | | | | | | |
| Turns Per Coil (TPC) | | | | | | | |
| Machine Inertia (kg-m$^2$) | | | | | | | |
| Sheave Diametr (mm) | | | | | | | |

| **Motor Model** | BOMCOW 630Kg | BOMCOW 630Kg | BOMCOW 800Kg | BOMCOW 800Kg | BOMCOW 1000Kg | BOMCOW 1000Kg | | |
|---|---|---|---|---|---|---|---|---|
| Otis P/N DAA20220- | AJ1, T1, T10 | AJ2, AJ3, T2, T3, T11, T12 | AJ4, T4, T13 | AJ5, AJ6, T5, T6, T14, T15 | AJ7, T7, T16 | AJ8, AJ9, T8, T9, T17, T18 | | |
| **3-1 CONTRACT** | | | | | | | | |
| Motor Type | 321 | 322 | 323 | 324 | 325 | 326 | | |
| **3-4 MACHINE** | | | | | | | | |
| Number of Poles | 20 | 20 | 20 | 20 | 20 | 20 | | |
| Rated Trq Nm | 460 | 460 | 550 | 550 | 665 | 665 | | |
| Rated Trq I A | 8.4 | 15.6 | 9.7 | 18 | 11.3 | 21 | | |
| Ld mH | 228.1 | 75 | 172.1 | 56.2 | 130.8 | 44 | | |
| Lq mH | 203.8 | 67 | 156.2 | 51.0 | 118.9 | 40 | | |
| R Ohm | 9.39 | 3.14 | 6.84 | 2.34 | 4.88 | 1.66 | | |
| T/A Slope % | 27.3 | 15 | 20 | 11 | 27.3 | 15 | | |
| T/A Offset A | 2.0 | 2 | 2 | 4 | 2 | 4 | | |
| Kt Slope 1/kNm | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Id Saturation A | 6.7 | 10 | 10 | 15 | 10 | 15 | | |
| Iq Saturation A | 2.1 | 7 | 4.5 | 15 | 3 | 10 | | |
| Ld Slope mH/A | 5.5 | 1.86 | 3.96 | 1.34 | 3.55 | 0.78 | | |
| Lq Slope mH/A | 2.3 | 0.57 | 0.79 | 0.2 | 0.91 | 0.33 | | |
| Lq0 mH | 203.8 | 67 | 96 | 51 | 118.9 | 40 | | |
| Lq1 1/mA | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Lq2 1/mA^2 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Ld0 mH | 229 | 75 | 172 | 56.2 | 85 | 30 | | |
| Rated Mag I A | - | - | - | - | - | - | | |
| Peak Mag I A | - | - | - | - | - | - | | |
| Rtr Time Const s | - | - | - | - | - | - | | |
| Rated Motor rpm | 96 | 168 | 96 | 168 | 96 | 168 | | |
| Mag err thr eDeg | 20 | 20 | 20 | 20 | 20 | 20 | | |
| Fld Wkn Lvl % | 100 | 100 | 100 | 100 | 100 | 100 | | |
| Fld Wkn BW Hz | 10 | 10 | 10 | 10 | 10 | 10 | | |
| **Machine Parameters not in SVT** | | | | | | | | |
| Turns Per Coil (TPC) | | | | | | | | |
| Machine Inertia (kg-m$^2$) | | | | | | | | |
| Sheave Diametr (mm) | | | | | | | | |

| **MACHRAT** | 3.0T5103A, 3.0T5102A | 3.0T5107A, 3.0T5104A |
|---|---|---|
| **Motor Model** | BOMCOW 320Kg 1.0m/s, 0.63m/s | BOMCOW 630Kg 1.0m/s, 0.63m/s |
| Otis P/N DAA20220- | CH1, CH2 | CH3, CH4 |
| **3-1 CONTRACT** | | |
| Motor Type | 310 | 311 |
| **3-4 MACHINE** | | |
| Number of Poles | 20 | 20 |
| Rated Trq Nm | 665 | 665 |
| Rated Trq I A | 6.1 | 9.2 |
| Ld mH | 616 | 209 |
| Lq mH | 616 | 209 |
| R Ohm | 24.5 | 8.3 |
| T/A Slope % | 0 | 0 |
| T/A Offset A | 0 | 0 |
| Kt Slope 1/kNm | 0 | 0 |
| Id Saturation A | 0 | 0 |
| Iq Saturation A | 0 | 0 |
| Ld Slope mH/A | 0 | 0 |
| Lq Slope mH/A | 0 | 0 |
| Lq0 mH | 616 | 209 |
| Lq1 1/mA | 0 | 0 |
| Lq2 1/mA^2 | 0 | 0 |
| Ld0 mH | 616 | 209 |
| Rated Motor rpm | 33 | 66 |
| Mag err thr eDeg | 40 | 20 |
| LRT DC Level PU | 0.1 | 0.1 |
| LRT mot err eDeg | 10 | 10 |
| Fld Wkn Lvl % | 100 | 100 |
| Fld Wkn BW Hz | 1.5 | 2 |

## 9.1 Motor parameter for SkyMotion 160 Machine

This machine is required for setting the motor type to 902, and then you can manually input for each brake and motor parameters.
For the PM30T machine, you can use the “Motor type = 731-734” as the pre-defined parameter above.
The brake parameters are different from PM30T and SM160 machine.

| **Motor Model** | **16T-5118A Type1** | **16T-5118B Type2** | |
|---|---|---|---|
| Max Duty | 1800kg | 2250kg | |
| Max speed | 7mps | 7mps | |
| Max Rise | | | |
| Otis P/N Motor assembly | J_A20226AAH1,2 J_A20226ABK1,2,5,6 | J_A20226AAH3,4 J_A20226ABK3,4,7,8 | Motor assembly is same as PM30T. |
| **3-4 MACHINE** | | | |
| Low Volt Op 0/1 | 0 | 0 | |
| Number of Poles | 36 | 36 | |
| Rated Trq Nm | 3724 | 4655 | |
| Rated Trq I A | 131.9 | 160 | |
| Ld mH | 2.02 | 1.7 | |
| Lq mH | 2.11 | 1.72 | |
| R Ohm | 0.15 | 0.13 | |
| T/A Slope % | 0 | 0 | |
| T/A Offset A | 0 | 0 | |
| Kt Slope 1/kNm | 0 | 0 | |
| Id Saturation A | 65 | 0 | |
| Iq Saturation A | 86 | 80 | |
| Ld Slope uH/A | 2.6 | 3 | For OVF428G,460G |
| Ld Slope mH/A | 0 | 0 | For 160ACR |
| Lq Slope uH/A | 1.6 | 0.9 | For OVF428G,460G |
| Lq Slope mH/A | 0 | 0 | For 160ACR |
| Lq0 mH | 2.11 | 1.72 | |
| Lq1 1/mA | 0 | 0 | |
| Lq2 1/mA^2 | 0 | 0 | |
| Ld0 mH | 2.02 | 1.7 | |
| Rated Motor rpm | 176 | 176 | |
| Mag err thr eDeg | 20 | 20 | |
| LRT AC Level PU | 0.09 | 0.09 | |
| LRT DC Level PU | 0.15 | 0.15 | |
| LRT mot err eDeg | 8 | 8 | |
| Fld Wkn Lvl % | 100 | 100 | |
| Fld Wkn BW Hz | 10 | 10 | |
| Inv Hrmnc On 0/1 | 0 | 0 | |
| **Machine Parameters not in SVT** | | | |
| Sheave Diametr (mm) | 760 | 760 | |

### 9.1.1 Brake parameter for SkyMotion 160 Machine

| Drive | 428G | 428G | 428G |
|---|---|---|---|
| Number of brake | 2 Brakes | 3 Brakes | 4 Brakes |
| Otis P/N | | | |
| 3-3 BRAKE | | | |
| BCM present 0/1 | 1 | 1 | 1 |
| Brk Sw Type 0-6 | 1 | 5 | 5 |
| Brk Pick Time ms | 5000 | 5000 | 5000 |
| Brk Setl Time ms | 100 | 100 | 100 |
| Lft Brk Delay ms | 100 | 100 | 100 |
| Brk Lftd Dely ms | 30 | 30 | 30 |
| Brk ramp up t ms | 1000 | 1000 | 1000 |
| Brk ramp dn t ms | 200 | 200 | 200 |
| Brk hold Dely ms | 500 | 500 | 500 |
| Brk Pick A | 7.4 | 3.7 | 7.4 |
| Brk Pick % | 85 | 85 | 85 |
| Brk Hold A | 3.0 | 1.5 | 3.0 |
| Brk Drop % | 20 | 20 | 20 |
| Brk Bus OVT % | 130 | 130 | 130 |
| Brk OCT A | 10 | 6 | 10 |
| Brk Bus UVT % | 70 | 70 | 70 |
| Brk Nom DC V | 310 | 310 | 310 |
| Brk dcv fscale V | 1050 | 1050 | 1050 |
| Brk Crr fsclae A | 15.7 | 15.7 | 15.7 |
| Brk R ohm | 11.65 | 50 | 23.3 |
| Brk L H | 2 | 4 | 1 |
| Brk I bw pick Hz | 1 | 1 | 1 |
| Brk I bw hold Hz | 0.2 | 0.2 | 0.2 |

## 9.2 Motor parameter for SkyMotion 260 Machine

This machine is required for setting the motor type to 902, and then you can manually input for each brake and motor parameters.

| **Drive** | **428G** | **428G** | **460G** | **460G** |
|---|---|---|---|---|
| **Motor Model** | **25T-5112A** | **25T-5117A** | **25T-5117B** | **25T-5121B** |
| Max Duty | 2700kg | 2000kg | 4000kg | 3600kg |
| Max speed | 6mps | 8mps | 8mps | 10mps |
| Max Rise | 300m | 300m | 300m | 300m |
| **Otis P/N** | | | | |
| **3-4 MACHINE** | | | | |
| Low Volt Op 0/1 | 0 | 0 | 0 | 0 |
| Number of Poles | 40 | 40 | 40 | 40 |
| Rated Trq Nm | 7500 | 5600 | 10500 | 10500 |
| Rated Trq I A | 168 | 164 | 307 | 382 |
| Ld mH | 3 | 1.6 | 1 | 0.8 |
| Lq mH | 3 | 2 | 1.4 | 1 |
| R Ohm | 0.2 | 0.12 | 0.07 | 0.05 |
| T/A Slope % | 0 | 0 | 0 | 0 |
| T/A Offset A | 0 | 0 | 0 | 0 |
| Kt Slope 1/kNm | 0 | 0 | 0 | 0 |
| Id Saturation A | 0 | 0 | 0 | 0 |
| Iq Saturation A | 0 | 0 | 0 | 0 |
| Ld Slope uH/A | 0 | 0 | 0 | 0 |
| Lq Slope uH/A | 0 | 0 | 0 | 0 |
| Lq0 mH | 3 | 2 | 1.4 | 1 |
| Lq1 1/mA | 0 | 0 | 0 | 0 |
| Lq2 1/mA^2 | 0 | 0 | 0 | 0 |
| Ld0 mH | 3 | 1.6 | 1 | 0.8 |
| Rated Motor rpm | 124 | 165 | 165 | 206 |
| Mag err thr eDeg | 25 | 25 | 25 | 25 |
| LRT AC Level PU | 0.09 | 0.09 | 0.09 | 0.09 |
| LRT DC Level PU | 0.15 | 0.15 | 0.15 | 0.15 |
| LRT mot err eDeg | 8 | 8 | 8 | 8 |
| Fld Wkn Lvl % | 100 | 100 | 100 | 100 |
| Fld Wkn BW Hz | 2.5 | 2.5 | 2.5 | 2.5 |
| Inv Hrmnc On 0/1 | 0 | 0 | 0 | 0 |
| **Machine Parameters not in SVT** | | | | |
| Sheave Diametr (mm) | 925 | 925 | 925 | 925 |

### 9.2.1 Brake parameter for SkyMotion 260 Machine

| Drive | 428G | 428G | 460G |
|---|---|---|---|
| Number of brake | 3 Brakes | 4 Brakes | 4 Brakes |
| Otis P/N | | | |
| **3-3 BRAKE** | | | |
| BCM present 0/1 | 1 | 1 | 1 |
| Brk Sw Type 0-6 | 5 | 5 | 5 |
| Brk Pick Time ms | 5000 | 5000 | 5000 |
| Brk Setl Time ms | 100 | 100 | 100 |
| Lft Brk Delay ms | 100 | 100 | 100 |
| Brk Lftd Dely ms | 30 | 30 | 30 |
| Brk ramp up t ms | 1000 | 1000 | 1000 |
| Brk ramp dn t ms | 200 | 200 | 200 |
| Brk hold Dely ms | 500 | 500 | 500 |
| Brk Pick A | 3.7 | 7.4 | 7.4 |
| Brk Pick % | 85 | 85 | 85 |
| Brk Hold A | 1.5 | 3.0 | 3.0 |
| Brk Drop % | 20 | 20 | 20 |
| Brk Bus OVT % | 130 | 130 | 150 |
| Brk OCT A | 6 | 10 | 10 |
| Brk Bus UVT % | 70 | 70 | 70 |
| Brk Nom DC V | 310 | 310 | 230 |
| Brk dcv fscale V | 1050 | 1050 | 1050 |
| Brk Crr fsclae A | 15.7 | 15.7 | 15.7 |
| Brk R ohm | 70 | 23.3 | 23.3 |
| Brk L H | 4 | 1 | 1 |
| Brk I bw pick Hz | 1 | 1 | 1 |
| Brk I bw hold Hz | 0.2 | 0.2 | 0.2 |

# 10 Inertia Calculations

## 10.1 System Inertia Formula

For larger systems (usually gearless systems, or systems with compensation ropes), the following formula should be used:

$$J = J_1 + J_2 + J_3$$

$$J_1 = \left( \frac{d_{shv}^2}{4r^2 g_r^2} \right) \left( M_{car} + \frac{M_{duty}}{2} + M_{cwt} + M_{comp} \right) + J_{machine}$$

$$J_2 = \left( \frac{d_{shv}^2}{4r g_r^2} \right) M_{rope}$$

$$J_3 = \left( \frac{d_{shv}^2}{r^2 g_r^2 d_{comp}^2} \right) J_{comp}$$

where:

| | |
|---|---|
| $d_{shv}$ | diameter of drive sheave (m) |
| r | roping ratio (1= 1:1, 2= 2:1, etc.) |
| $g_r$ | gear ratio of gearbox (if any) (1= 1:1, 17 = 17:1 etc.) |
| $M_{car}$ | mass of empty car (kg) |
| $M_{cwt}$ | mass of counterweight (kg) |
| $J_{machine}$ | total rotating inertia of all sheaves, including rotor inertia and drive sheave inertia, excluding Comp Sheave inertia, (kg-m2) |
| $M_{rope}$ | mass of ropes (kg) |
| $M_{comp}$ | mass of compensation ropes (kg) |
| $J_{comp}$ | inertia of Compensation Rope Sheave (kg-m2) |
| $d_{comp}$ | diameter of Compensation Rope Sheave (m) |

## 10.2 System Inertia Approximation

For smaller systems (usually geared systems, or systems without compensating ropes), the following approximation for inertia may be satisfactory:

$$J = \left( \frac{d_{shv}^2}{4r^2 g_r^2} \right) \left( M_{car} + \frac{M_{duty}}{2} + M_{cwt} \right) + J_{machine}$$

This approximation is derived by assuming $J_{comp} = M_{comp} = M_{rope} = 0$.