

**Subject:** Motion Systems using Yaskawa Servo Amplifiers with Exlar Actuators

**Product:** Sigma II SGDH amplifiers with Exlar SR and GSX series actuators

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### Product Line Description:

Exlar, Inc. (Chanhassen, MN) is a leading manufacturer of electric roller screw actuators. For specifications and sizing on Exlar actuators, visit their website at <http://www.exlar.com>. Customers specifying and purchasing actuators from Exlar will find this document useful in selecting the appropriate amplifier and accessory components for your system. Contact your local Yaskawa sales representative or distributor for price and availability on Sigma II amplifiers.

The combination of Exlar actuators with Yaskawa Sigma II SGDH amplifiers offers the following advantages to the user:

- 2 to 18 inch travel lengths
- 100 to 8000 pounds of thrust
- Travel speeds up to 33 in/sec
- Available for incremental and absolute positioning requirements\*
- Simplified amplifier set-up (“plug and play” with no motor parameter setup files needed for amplifier configuration)
- Choice of 110, 230, or 460 Volt systems (depending on actuator size)
- The Sigma II amplifiers are compatible with most PLC and PC-based general purpose motion controllers and indexers, as well as all Sigma II application modules, controllers and networks, as seen at Yaskawa’s website (<http://www.yaskawa.com>).



\*Exlar actuators with Yaskawa encoders will have absolute positioning data throughout the travel length and can be used with compatible controllers from Yaskawa, Delta Tau, Galil, and Ormec (consult Yaskawa sales representative for compatibility with other controllers).

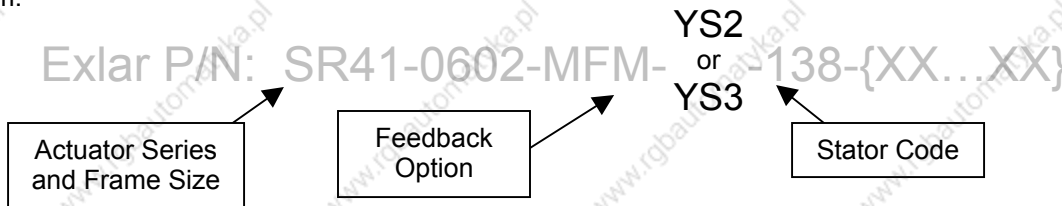
Yaskawa Electric America - 2121 Norman Drive South – Waukegan IL 60085  
(800) YASKAWA - Fax (847) 887-7280

**Actuator Part Numbering:**

Actuators for use with Sigma II amplifiers are designated by using the code **YS2** in the “Feedback Option” part of the Exlar actuator part number for four-inch frame actuators (17-bit absolute encoders).

For two- and three-inch actuators (16-bit absolute), use encoder designation **YS3**.

The actuator series and frame size are identified by the first set of numbers in the actuator part number. The stator code is the three digit code toward the end of the actuator part number (it may be followed by other characters designating options on the actuator). In the combination tables that follow, this series/size designator will be used to determine the appropriate Yaskawa Sigma II amplifier for the system.



**Amplifier Combinations – GSX40 and SR41 (using YS2 amplifier designation):**

Actuator Series	Stator	Stroke Lengths [in]	System Voltage	Sigma II Amplifier*
GSX40	138	6, 8, 12, 18	230 (1-phase)	SGDH-15AE-S
			230 (3-phase)	SGDH-10AE
GSX40	168	6, 8, 12, 18	460	SGDH-10DE
GSX40	238	6, 8, 12, 18	230 (1-phase)	SGDH-15AE-S
			230 (3-phase)	SGDH-15AE
GSX40	268	6, 8, 12, 18	460	SGDH-15DE
GSX40	338	8, 12, 18	230	SGDH-20AE
GSX40	368	8, 12, 18	460	SGDH-20DE
SR41	138	6, 12	230 (1-phase)	SGDH-15AE-S
			230 (3-phase)	SGDH-10AE
SR41	168	6, 12	460	SGDH-10DE
SR41	238	6, 12	230 (1-phase)	SGDH-15AE-S
			230 (3-phase)	SGDH-15AE
SR41	268	6, 12	460	SGDH-15DE

\* Exlar actuators are only compatible with Sigma II amplifiers. Actuators compatible with the Yaskawa Legend (SGDG) amplifiers are not available.

**Amplifier Combinations – GSX30 and SR31 (using YS3 amplifier designation):**

Actuator Series	Stator	Stroke Lengths [in]	System Voltage	Sigma II Amplifier*
GSX30	138	3, 6, 10, 14, 18	230 (1-phase)	SGDH-08AE-S
			230 (3-phase)	SGDH-05AE
GSX30	168	3, 6, 10, 14, 18	460	SGDH-05DE
GSX30	238	3, 6, 10, 14, 18	230 (1-phase)	SGDH-08AE-S
			230 (3-phase)	SGDH-08AE
GSX30	268	3, 6, 10, 14, 18	460	SGDH-10DE
GSX30	338	6, 10, 14, 18	230 (1-phase)	SGDH-15AE-S
			230 (3-phase)	SGDH-10AE
GSX30	368	6, 10, 14, 18	460	SGDH-10DE
SR31	138	6, 12	230 (1-phase)	SGDH-08AE-S
			230 (3-phase)	SGDH-05AE
SR31	168	6, 12	460	SGDH-05DE
SR31	238	6, 12	230 (1-phase)	SGDH-08AE-S
			230 (3-phase)	SGDH-08AE
SR31	268	6, 12	460	SGDH-10DE

\* Exlar actuators are only compatible with Sigma II amplifiers. Actuators compatible with the Yaskawa Legend (SGDG) amplifiers are not available.

**Amplifier Combinations – GSX20 and SR21 (using YS3 amplifier designation):**

Actuator Series	Stator	Stroke Lengths [in]	System Voltage	Sigma II Amplifier*
GSX20	118	3, 6, 12	115 (1-phase)	SGDH-02BE
GSX20	138	3, 6, 12	230 (1-phase)	SGDH-02AE
GSX20	168	3, 6, 12	460	SGDH-05DE
GSX20	238	3, 6, 12	230 (1-phase)	SGDH-08AE-S
			230 (3-phase)	SGDH-05AE
GSX20	268	3, 6, 12	460	SGDH-05DE
GSX20	338	6, 12	230 (1-phase)	SGDH-08AE-S
			230 (3-phase)	SGDH-08AE
GSX20	368	6, 12	460	SGDH-10DE
SR21	118	6,12	115 (1-phase)	SGDH-02BE
SR21	138	6, 12	230 (1-phase)	SGDH-02AE
SR21	168	6, 12	460	SGDH-05DE
SR21	218	6,12	115 (1-phase)	SGDH-04FE
SR21	238	6, 12	230 (1-phase)	SGDH-04AE
SR21	268	6, 12	460	SGDH-05DE

\* Exlar actuators are only compatible with Sigma II amplifiers. Actuators compatible with the Yaskawa Legend (SGDG) amplifiers are not available.

### Cable Selection:

The motor power and encoder cables for Exlar actuators are shown in the table below. Note that the required power cable varies depending on the control system voltage. For actuators with holding brakes, the brake cable is a separate item and can be ordered from Exlar.

100V/200V Power Cable	400V Power Cable	Encoder Cable (200V or 400V)
B1E-□□(A)	BAE-□□(A)	JZSP-CMP02-□□(B)

Replace the □□ in the above part numbers with the desired length in meters: **-03, -05, -10** (standard), **-15**, and **-20** are available cable lengths for all of the listed cables.

The larger wire gauge of the listed cable does not interface correctly with the terminal blocks on 400W and smaller SGDh amplifiers. If the SGDh-02 or -04 amplifiers are to be used, it is strongly recommended that motor power connector **231-105/026-000** also be ordered to allow a proper interface with the amplifier.

### Wiring:

Follow standard wiring practices as described in the *Sigma II Series Servo System User's Manual* (YEA-SIA-S800-32.2), available from YEA's literature department and on the Motion Product CD (YEA-CD-MTN-1). Wiring is discussed in chapter 3 of the User's Manual. Fuse/circuit breaker sizes are listed in section 5.8.1 of the same manual.

### Amplifier Setup Requirement:

Because the Exlar actuators utilize Yaskawa serial encoders, there is no special set-up to be done with the Yaskawa amplifiers. When the motor is powered up, the serial encoder will send the actuator speed/torque parameters to the amplifier.

**Important:** Many applications do not require the absolute position data that the absolute encoder provides. The SGDh amplifier can be configured to provide incremental encoder output to the upper controller by setting parameter Pn002.2 to 1. See *Sigma II Series Servo System User's Manual* section 5.7.2.

There are three methods for setting SGDh parameters:

- The built-in keypad on the front of the operator.
- **SigmaWin 100**, a full-featured PC-based software package available from Yaskawa.
- **SigmaWin Lite**, a basic parameter-setting and monitoring software package for the PC, available for free on Yaskawa's website.

### Application Considerations:

The overload curve for the SGDh amplifiers is reduced when used with Exlar actuators. The maximum amount of time that the actuator can apply full torque is reduced to one second (instead of more than three seconds with a standard Yaskawa motor-amplifier combination). This is based on Exlar recommendation.

As with all linear applications, it is important to prevent the load from reaching the end of its linear travel by implementing hardware limit switches or software limits. If position limiting (either hardware or software) is neglected and the rod reaches its linear end of travel, the Exlar actuator rod will begin to apply *rotational torque* to whatever device to which it is coupled. This can cause unexpected machine operation:

- The rod may provide torque to the machine or coupling, causing a torque overload or, in some situations, mechanical failure.
- There may be movement of the encoder without corresponding linear movement of the actuator rod, resulting in incorrect position data.

### Regeneration Energy:

Regeneration energy should be calculated by Exlar when the application is sized. Many Yaskawa amplifiers have regeneration resistors built-in, as listed in the chart below. If extra regeneration capacity is needed, external regeneration resistors can be added to the application, just as they can with a rotary application.

Regenerative resistors for servo amplifiers are internally mounted as shown in the following table. They can be mounted externally on all servo amplifiers, but are especially effective when regenerative energy exceeds the servo amplifiers capacity.

When mounted externally, be sure to remove the jumper between B2 and B3 (SGDH-04 and smaller only) which deactivates the internal regenerative resistor. Also be sure to set parameter Pn600 correctly. **Important:** External regeneration resistor sizing and amplifier set-up will be important for proper operation.

Use Yaskawa's *Sigma II Series Servo System User's Manual* (YEA-SIA-S800-32.2) section 5.6.

(See chart on next page for specific information on regeneration for each amplifier.)

**PRODUCT NOTE**  
MOTION PRODUCT ENGINEERING GROUP



Voltage	Applicable Servo Amplifier	Resistance of built-in resistor ( $\Omega$ )	Nominal wattage of built-in resistor* (W)	Effective Capacity of Internal Resistor (W)	Minimum Allowable Resistance ( $\Omega$ )
115	SGDH-02BE	-	-	-	40
115	SGDH-04FE	-	-	-	40
230	SGDH-02AE	-	-	-	40
230	SGDH-04AE	-	-	-	40
230	SGDH-05AE	50	60	12	40
230	SGDH-08AE	50	60	12	40
230	SGDH-08AE-S	50	60	12	40
230	SGDH-10AE	50	60	12	40
230	SGDH-15AE	30	70	14	20
230	SGDH-15AE-S	25	140	28	20
230	SGDH-20AE	25	140	28	12
460	SGDH-05DE	108	70	14	73
460	SGDH-10DE	108	70	14	73
460	SGDH-15DE	108	70	14	73
460	SGDH-20DE	45	140	28	44

\*Capacity prior to de-rating. If regeneration power requirements exceed internal capacity of amp, install an external regeneration resistor (reference "Minimum Allowable Resistance"). Be sure to de-rate wattage of external resistor to 20% or less (natural convection) and to 50% or less with forced air cooling.