Table of contents

Basics on the motors to be controlled

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.General information

The ctrlX DRIVE controllers can control three-phase a.c. motors:

.Supported three-phase a.c. motors

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Motor type	Supported types	Not supported types
Asynchronous motor (ASM)	All	
Synchronous motor (SM)	Permanent-magnet SM (PMSM / SPMSM) - with reluctance effect (IPMSM)	- electrically excited SM - SM with damper winding (short circuit rods)
Reluctance motor (RM)	Synchronous RM (SynRM) - without permanent magnets	Switched RM (SRM)

.Types of construction

The following types of construction are supported:

- Rotary motors (asynchronous, synchronous)
- Linear motors (synchronous)

Both types of construction can be used in housing design (motor with an output shaft that includes the bearing) or in kit design (stator and rotor as individual components).

. Rexroth motors

In the case of **Rexroth motors**, the manufacturer provides a specific data set for adjusting each motor type. The data are documented by the manufacturer as parameter values, stored and made available in motor-specific parameter sets. Rexroth housing motors are supplied with the corresponding parameter set in the encoder memory (Plug and Play).

.Diagnostic motor operation data

The firmware provides the option to collect dynamic operating data of the motor and store them (operating hours counter, thermal and mechanical operating data, operational performance).

.Relevance for the user

.Use case

Maximum voltage of the motor is smaller than peak value of the supplying mains voltage.

.Application-related information for project planning

.Hardware data

For the electrical connection of the motor to the controller, see the Project Planning Manuals of the ctrlX DRIVE contollers. For Rexroth motors, a complete connection diagram is contained in the respective Project Planning Manual.

To use the temperature-dependent fan control, the required outputs (digital or analog) have to exist and be available for this purpose.

.Adjusting motor / controller

The ctrlX DRIVE controllers are adjusted to the motor to be controlled by providing or inputting the motor-specific data.

If **motors by third-party manufacturers** are to be controlled, it is necessary to check, using the motor data and the data of the possibly available motor encoder, whether they are basically suited for operation with ctrlX DRIVE. The parameter values for adjusting the controller have to be specifically determined for each motor.

.Adjusting mains voltage / motor

Third-party motors whose winding insulation is not suited for the maximum DC bus voltage of ctrlX DRIVE devices, can be protected against inadmissibly high voltage by parameterizing the maximum DC bus voltage allowed for these motor types. The braking resistor threshold is adjusted to the value of this parameter and the DC bus voltage is limited to this value ("output stage locked"). If the DC bus voltage to be expected is higher than the one allowed for the motor, check whether a voltage allowed for the motor can be achieved by reducing the mains voltage or DC bus voltage control.

.Nominal mains voltage and motors

Rexroth motors are suitable for a mains voltage 3 x 400 V AC.

Exception: Rexroth motors mains voltage 3 x 230 V AC:

- Small-power motors MSM
- Small-power linear motors MCL, ironless

.Regenerating torque/force, blending operation

The corrosion layer reduces the braking effect in most cases. For this reason, it is basically recommended to resurface friction-fitting brakes, also refer to "Regenerating holding torque/force" in chapter "Function test of the holding brake"

.Commissioning

For general commissioning of motors, the following dialog is available in ctrlX DRIVE Engineering:

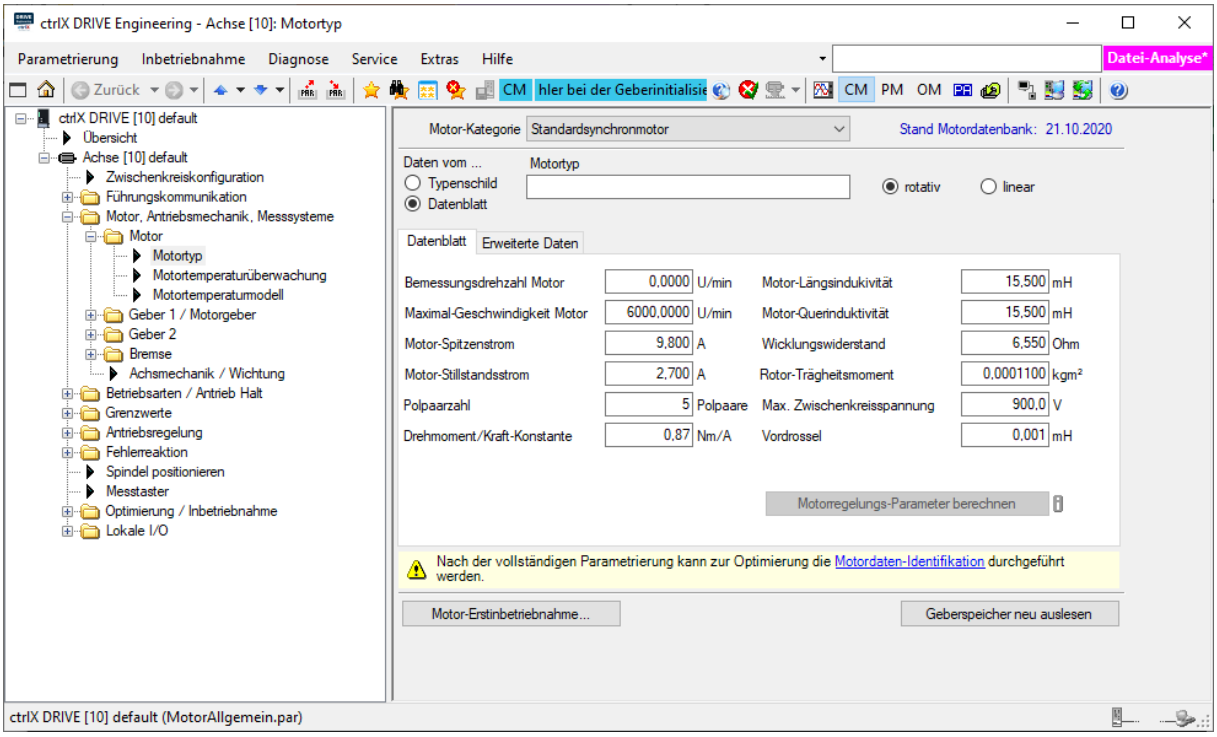

Fig. 143: ctrlX DRIVE Engineering, motor commissioning

For additional information on the commissioning of motors, please see the following links:

Bosch Rexroth motors>>> and third-party motors>>>

See also ↘ “Commissioning”

.Additional information and details

The motor can only generate full torque with an optimally adjusted controller. To avoid overloading the motor, the maximum current of the motor is taken into account to limit the current. For details and more information about the protection of the device and monitoring functions, refer to chapter "Current and torque/force limitation, power limitation" and chapter "Device protection and monitoring functions".

Rexroth motors ensure easy commissioning, full output performance and high operational safety due to motor-specific parameter values made available and temperature evaluation adjusted in an optimum way!

For series applications, the motor-specific data, motor control parameters, commutation offset, where applicable, and application-specific data of third-party motors with the appropriate encoder can be stored in the motor encoder memory.

.Parameters involved

.Motor parameters, general

- S-0-0109, Motor peak current
- S-0-0111, Motor current at standstill
- S-0-0113, Maximum motor velocity
- S-0-0141, Motor type
- S-0-0533, Nominal torque/force of motor
- S-0-0534, Maximum torque/force of motor
- S-0-1300.x.04, Device name
- S-0-1300.x.01, Component name
- S-0-1300.x.05, Vendor Device ID
- S-0-1300.x.08, Hardware version
- S-0-1300.x.11, Order Number
- S-0-1300.x.12, Serial number
- P-0-0018, Number of pole pairs/pole pair distance
- P-0-0051, Torque/force constant
- P-0-0113, Bipolar velocity limit value of motor
- P-0-0508, Commutation offset
- P-0-0510, Rotor inertia
- P-0-0640, Cooling type
- P-0-0853, Max. DC bus voltage, motor
- P-0-4014, Type of construction of motor
- P-0-4036, Rated motor speed
- P-0-4044, Phase inductance of preconnected choke
- P-0-4048, Stator resistance

.Synchronous motor parameters

- P-0-0448, Temperature-depend. torque/force coefficient
- P-0-0449, Speed-dependent torque/force coefficient
- P-0-0449, Speed-dependent torque/force coefficient
- P-0-0472, Motor saturation current
- P-0-3940, Motor torque/force at nominal current when using reluctance
- P-0-3941, Motor torque/force at maximum current when using reluctance
- P-0-3942, Reluctance angle at nominal motor current
- P-0-3943, Reluctance angle at maximum motor current
- P-0-4002, Charact. of quadrature-axis induct. of motor, inductances
- P-0-4003, Charact. of quadrature-axis inductance of motor, currents
- P-0-4005, Flux-generating current, limit value
- P-0-4013, Current limit value of demagnetization
- P-0-4015, Motor voltage constant
- P-0-4016, Direct-axis inductance of motor
- P-0-4017, Quadrature-axis inductance of motor

.Asynchronous motor parameters

- P-0-0600, Rated slip frequency
- P-0-4004, Magnetizing current
- P-0-4039, Stator leakage inductance
- P-0-4040, Rotor leakage inductance
- P-0-4041, Motor magnetizing inductance
- P-0-4042, Characteristic of motor magnetizing inductance
- P-0-4043, Rotor time constant

.Field weakening range parameters

- P-0-0528, Flux controller proportional gain
- P-0-0529, Scaling of stall current limit
- P-0-0530, Slip increase
- P-0-0532, Premagnetization factor
- P-0-0533, Voltage controller proportional gain
- P-0-0534, Voltage controller integral action time
- P-0-0535, Motor voltage at no load
- P-0-0536, Maximum motor voltage

.Parameters for motor holding brake (if available)

- S-0-0206, Drive on delay time
- S-0-0207, Drive off delay time
- P-0-0525, Brake control word
- P-0-0540, Torque/force of brake

.Parameters for temperature monitoring

- S-0-0201, Motor warning temperature
- S-0-0204, Motor shutdown temperature
- P-0-0512, Temperature sensor
- P-0-0513, Temperature sensor characteristic
- P-0-0640, Cooling type
- P-0-4034, Thermal time constant of winding
- P-0-4035, Thermal time constant of motor
- P-0-4037, Thermal short-time overload of winding
- P-0-3060.0.3, Speed-dependent reduction of motor shutdown temperature
- P-0-3060.0.4, Motor mounting situation
- P-0-3060.0.5, Reduction of motor shutdown temperature/1000 rpm
- P-0-3060.0.10, Thermal parameters, motor

.Default control loop parameters

- S-0-0100, Velocity controller proportional gain
- S-0-0101, Velocity controller integral action time
- S-0-0104, Position loop Kv-factor
- S-0-0106, Current controller proportional gain 1
- S-0-0107, Current controller integral action time 1

- S-0-0206, Drive on delay time
- S-0-0207, Drive off delay time
- P-0-0004, Speed controller smoothing time constant
- P-0-0082, Actual current value filter time
- P-0-3945, Motor control configuration