4.1.1 Nutrunner Motor Connection

The servo drive unit's output for the 3-phase motor is connected to the 20-pole connector at the top end of the nutrunner. Please note that the resolver cable is connected to the same connector.

The 15 and 25 Amps servo drive unit's connector – **K11** – is a 5-pole plug-in screw terminal (see table in section 3.7.3).

The 50 Amps servo drive unit's connector – **K21** – is a 9-pole plug-in screw terminal (see table in section 3.7.3).

The motor's cable connector is a 20-pole socket plug with crimp terminals (Burndy Electra UTG62020SN). See sections 5.6 for cabling details and section 3.7 for servo unit connector locations.

The motor connection to the servo drive unit is shown below:

K11	K21	Description	Motor Connector
1	1	Not Used	—
2	2 – 3	Cable Screen	(Chassie)
3	4 – 5	Phase U	3
4	6 – 7	Phase V	2
5	8 – 9	Phase W	1
Ground Bar		Protective ground	⏚ (Chassie)

4.2 Resolver

The nutrunner uses a resolver as a feedback element to the servo drive unit. The resolver is built like a generator with coils in both the stator and the rotor. It works like a variable transformer with one primary and two secondary windings.

The primary winding is fed by a 1 kHz constant voltage from the servo drive unit. The two secondary windings output voltages with an amplitude depending on the resolver shaft angle. The voltage amplitudes represent the sine and cosine functions of the shaft angle. The outputs are returned to the servo drive unit and converted to digital position and speed information.

The resolver is mounted in the nutrunner and makes possible the electronic commutation of the motor.

The servo drive unit controls the currents in the motor armature coils so that the electromagnetic field from the stator always is 90 degrees ahead of the permanent magnetic field of the rotor. The servo drive's amplifier stage needs continuous information of the motor's rotor position. The resolver's output signal supplies that information.

The signal is also used for speed information (emulating a tacho generator) and as a position feedback element (emulating an angle encoder). These qualities enables the system to maintain torque at zero speed.

The resolver must have a predefined angle position relative to the permanent magnets on the rotor. The synchronization of the resolver is made at the motor factory.

4.2.1 Resolver Connection

The resolver and the thermoelectric sensor are connected to the servo drive unit with a 15-pole D-Sub pin (male) connector **K6** at the bottom of the servo drive. The cable's other end is connected to the same 20-pole connector at the top of the nutrunner as the motor cable (section 4.1.1).

Following signals are used:

K6	Signal name	Description
1.	**Shield**	Cable screen. Connected to signal ground inside the servo drive unit. **Do not connect at the motor end**!
2.	**Sine –**	10 volts maximum peak value, 1 kHz.
3.	**Sine +**	10 volts maximum peak value, 1 kHz.
4.	**Cosine +**	10 volts maximum peak value, 1 kHz.
5.	**Cosine –**	10 volts maximum peak value, 1 kHz.
7.	**Signal Common**	Return wire for signals Nº 2 - 9.
9.	**Excitation**	5 – 10 volts peak value, 1 kHz.
14.	**+15 V**	Supplies the thermoelectric sensor in the nutrunner motor.
15.	**Thermistor input**	Signal wire for the thermoelectric sensor.

See section 3.7 for connector details and section 5.6 for cabling details (screening, pair twinning, grounding etc.).

4.3 Torque Transducer (for QCM-T/QCS-T only)

The nutrunner torque transducer for feedback signal to the servo drive is of strain gauge type. It measures the reaction torque in the nutrunner during the tightening cycle. The reaction torque is equal to the applied torque on the bolthead/nut. The transducer is mounted inside a replaceable section of the nutrunner. Excitation level is 10 VDC. The output signal is 8 mV at nominal load in footpounds and 5.9 mV at nominal load in Nm.

4.3.1 Torque Transducer Connection

The torque transducer is connected to the servo drive unit with a 9-pole D-Sub pin (male) connector – K6D – at the bottom of the servo drive. The cable is connected at the motor end with an 8-pole socket plug with crimp terminals (Burndy Electra UTG 6128 SN. Please see connector specification in our nutrunner ASL 14/36-30).

Following signals are used:

N°	Signal name	Description
1.	**Shield**	Cable screen. Connected to signal ground inside the servo drive unit.
4.	**Signal +**	Output signal 5.9 mV @ nom. load [Nm]
5.	**Signal –**	
7.	**Excitation +**	+ 5 VDC.
9.	**Excitation –**	- 5 VDC.

See section 3.7 for connector details and section 5.6 for cabling details (screening, pair twinning, grounding etc).

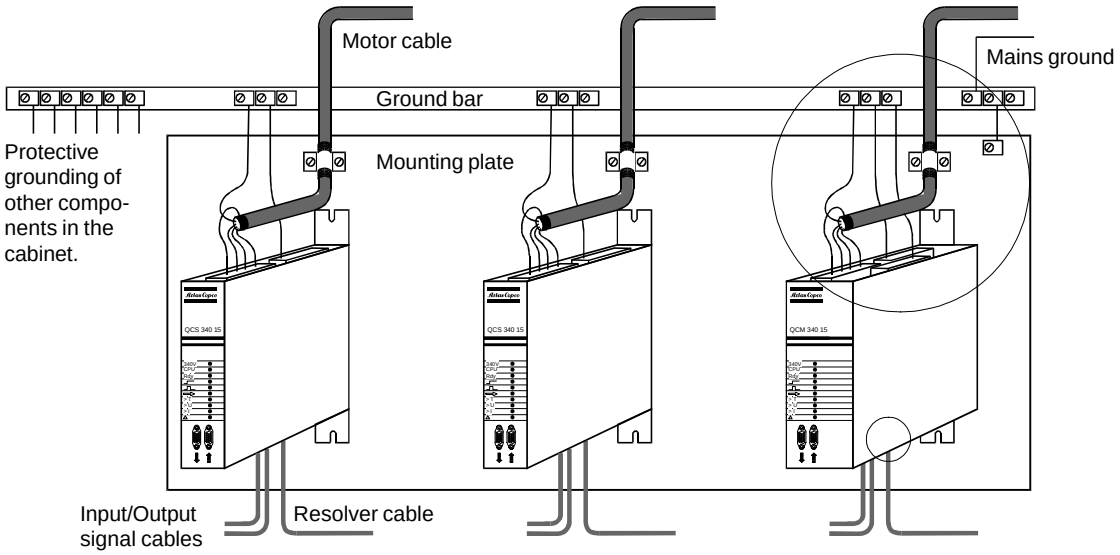
4.4 Gear

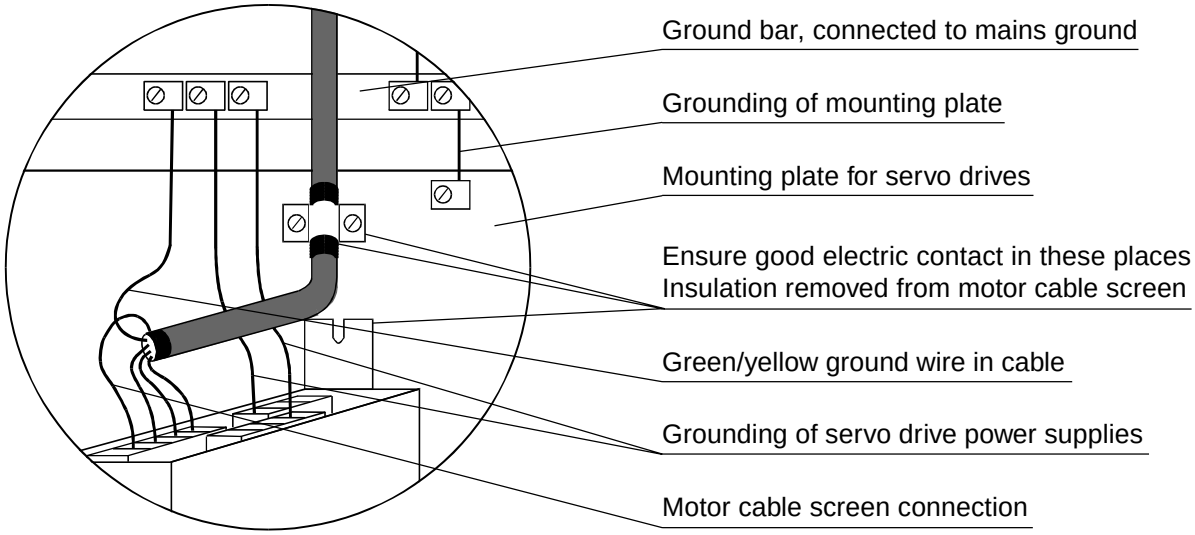
The QMR nutrunner includes a planetary gear to transform the output from the electric motor to lower speed and higher torque. Each of the four nutrunner sizes comes with different gear ratios. You can convert a nutrunner to an other model by changing the gear unit.

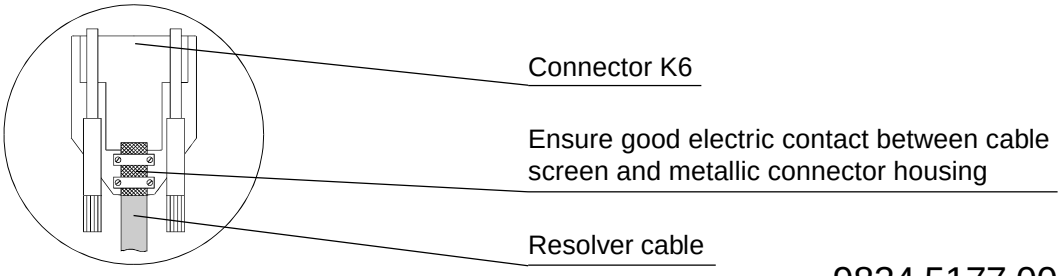
The same gear units are used for straight and offset nutrunner models.

You must know what gear unit the nutrunner uses, when you make a control program for the QCM-T/QCS-T or the QCM/QCS servo drive.

Appendix 4. Grounding the Servo Drive QCM/QCS







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