

4.1.2 Steering Steer by Wire

All B400R/RM/RH with a running number higher then 1000 are equipped with steer by wire (ATECH)

Description 7190VVJxxxxM

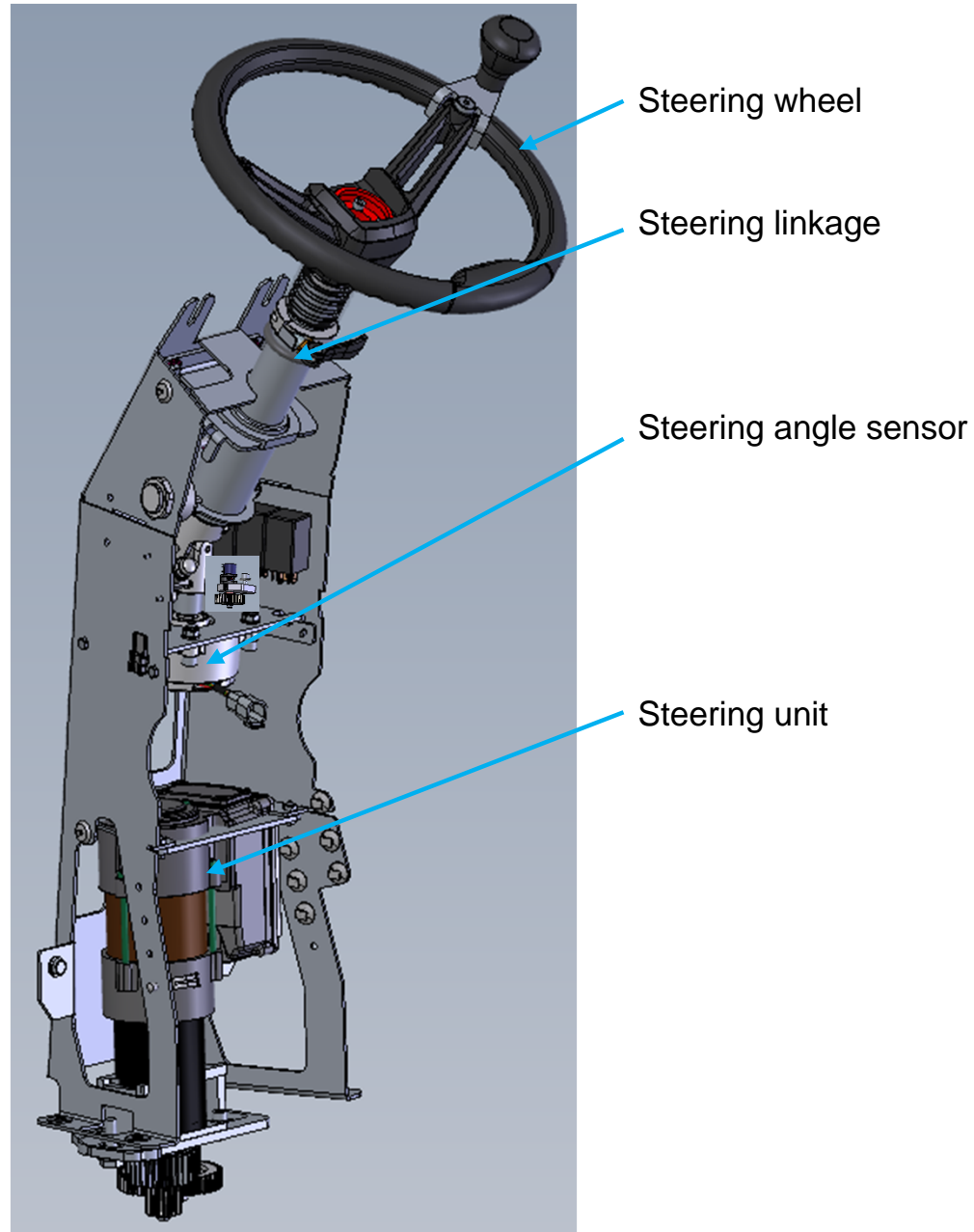
VV = Type (00 / 10 / 20 / 25 / 60 / 70)

J = Year

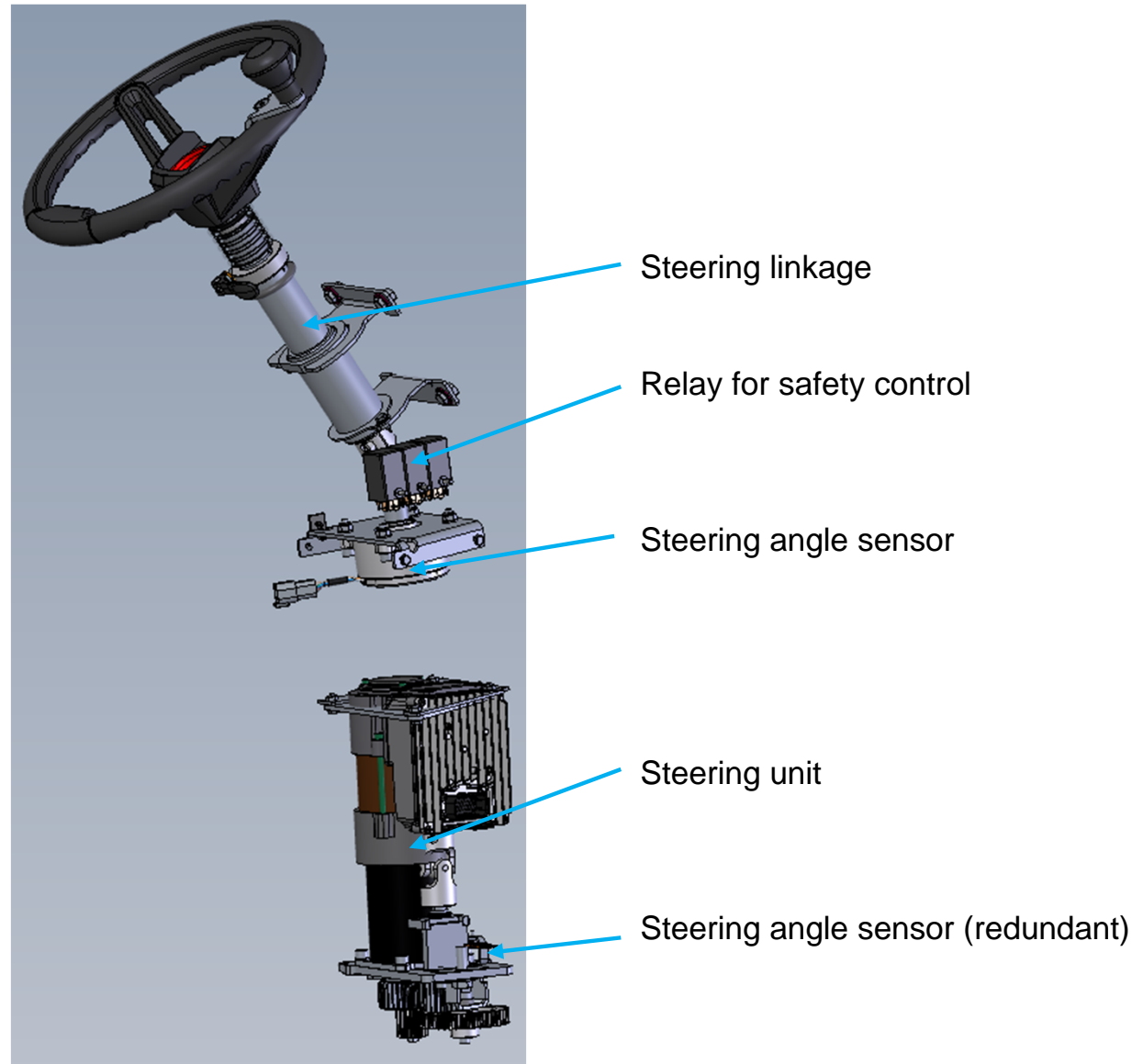
xxxx = running number; must be > 1500 then ATECH with brake wear sensor
between 1000 and 1499 then ATECH without brake wear sensor
< 999 Documents in document 4.1.1 Steering AMER

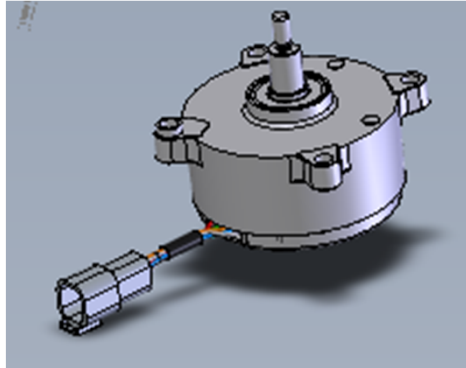
M = Month

Complete steering train



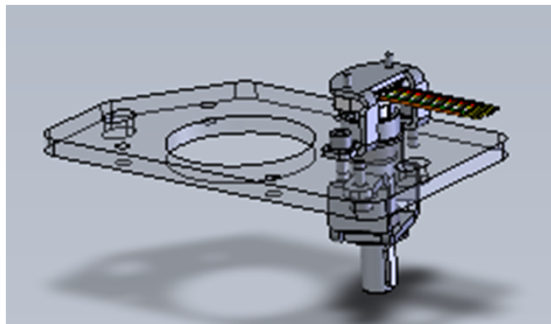
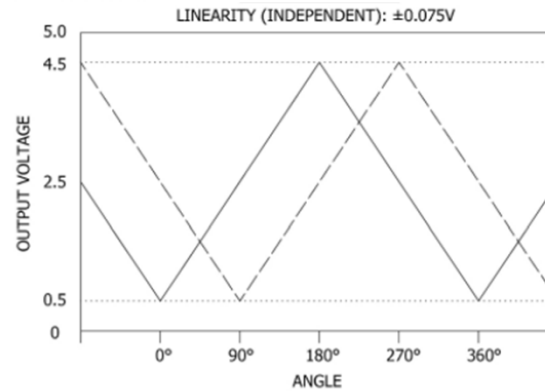
Steering Components





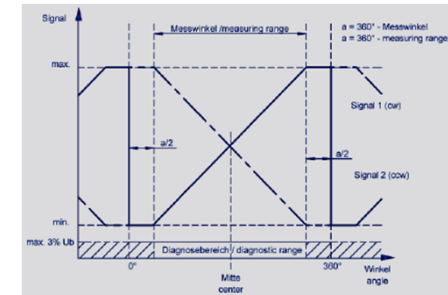
Steering angle sensor

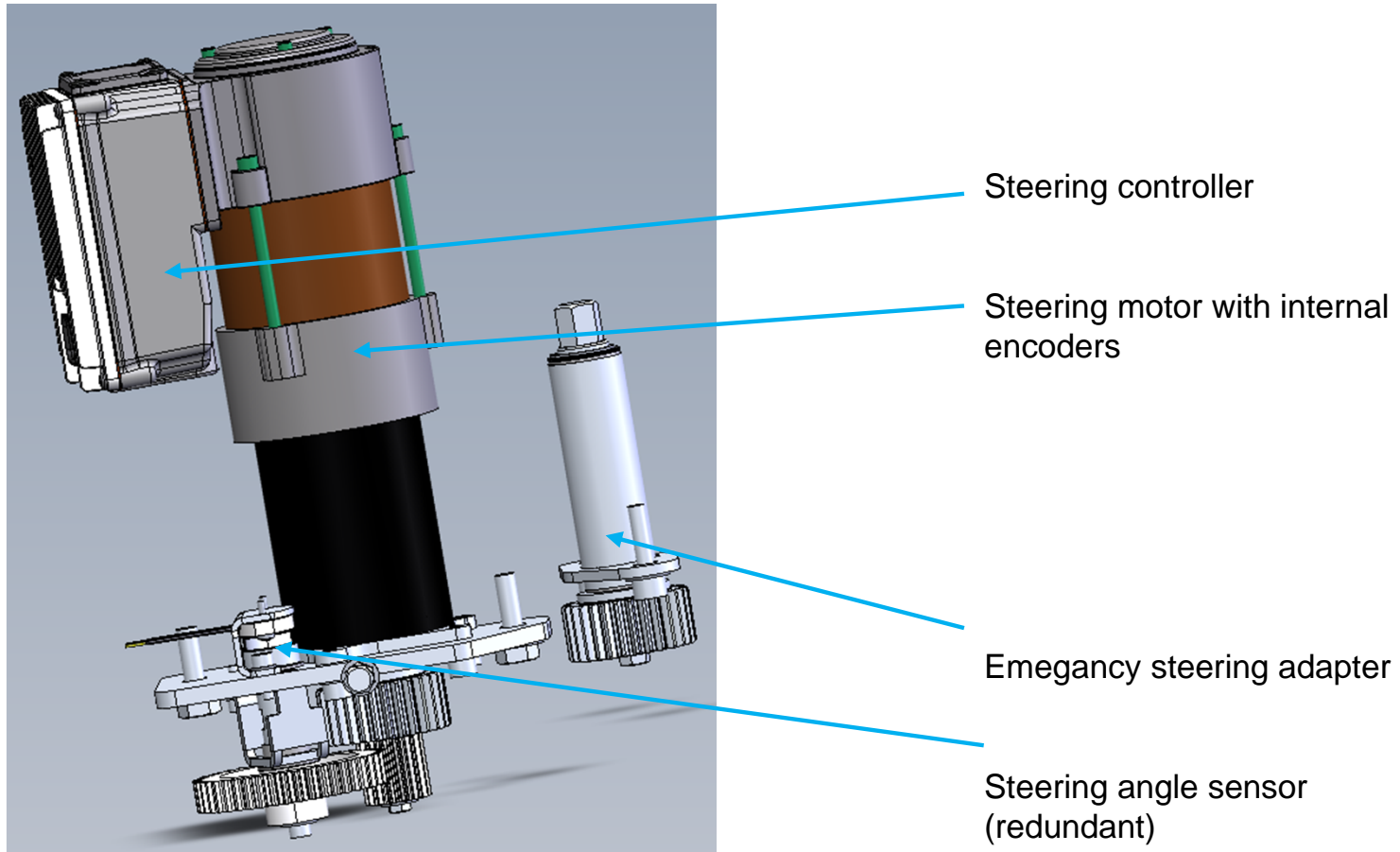
BRAKE COIL POWER	
SUPPLY CURRENT	CURRENT CONTROL (12VDC MINIMUM) 1.5A PEAK (30 SEC MAX DURATION)
COIL RESISTANCE @ 20° C	0A - 1.0A CONTINUOUS 10 Ω NOMINAL
SENSOR	
SENSOR TYPE	ABSOLUTE, NON-CONTACT, HALL EFFECT IC
IC SUPPLIER PART NO.	MELEXIS MLX90316
SUPPLY VOLTAGE	5.0 V ± 0.5 V PROTECTED STABLE SUPPLY
SUPPLY CURRENT (MAX)	11.5 mA EACH CHANNEL (OUTPUT SHORT TO GROUND)
SUPPLY CURRENT (TYP)	8.5 mA EACH CHANNEL
OUTPUT LOAD	PUSH-PULL OUTPUT STAGE
OUTPUT SIGNALS	2 OUTPUTS FOR REDUNDANCY
RESOLUTION	12 BIT
OUTPUT HYSTERESIS	<0.2° MEASURED NEAR 50% DUTY CYCLE
RANGE	MULTI-ROTATION
ALIGNMENT	NONE
POSITIVE ROTATION	COUNTER-CLOCKWISE AS VIEWED FROM THE STEERING WHEEL
ANALOG OUTPUT	RATIOMETRIC: 10% - 90% OF SUPPLY VOLTAGE
PWM OUTPUT	5V @ 200Hz ±40Hz LOW LEVEL CLAMP: 5% DUTY CYCLE HIGH LEVEL CLAMP: 95% DUTY CYCLE DUTY CYCLE: % TIME AT HIGH STATE, RISING EDGE TRIGGERED



Steering angle sensor (redundant)

- Winkelsensor (Hallgeber)
- Mehrkanalig
- Messwinkel 360°
- Versorgungsspannung $U_b = 5$ Volt (4,5 - 5,5 Volt)
- Ausgangssignal 0,25 – 4,75 Volt ratiometrisch
- Ausgang gekreuzte Kennlinien, Kanal 1 steigend w rechtsdrehend (teilredundant)
- Einzeldauern 4x0,5 Meter (0,5 mm²)



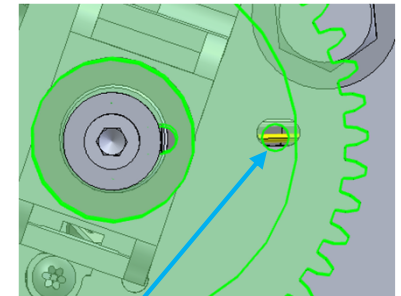
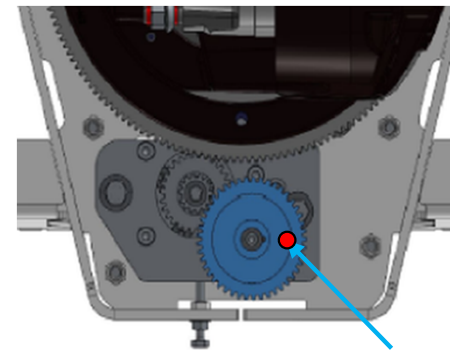
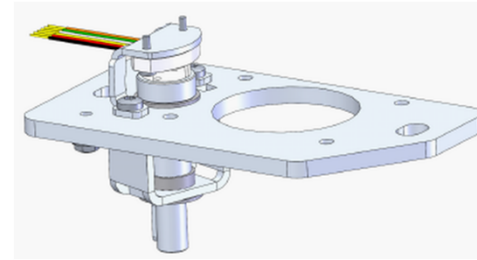
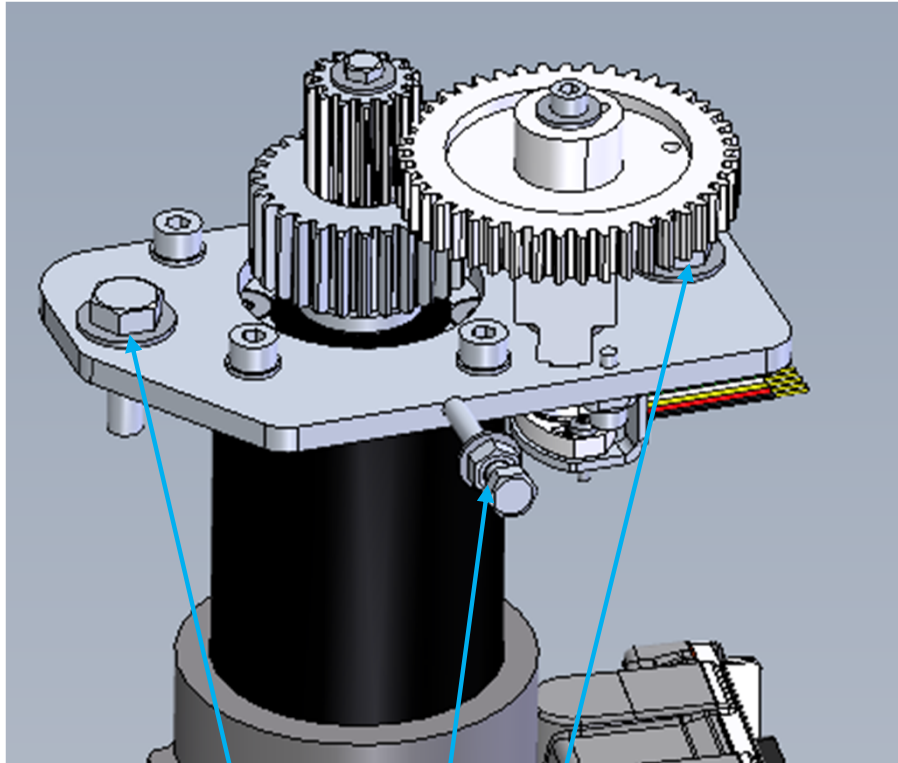


Motorspezifikation

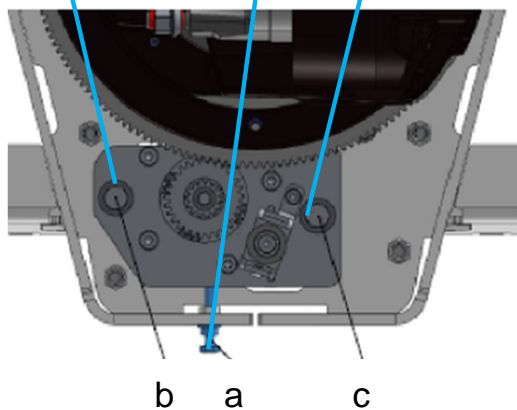
Lenkmotor (C38215A):	400 W S2 1h @ 3000 1/min AC-Asynchronmotor
Max. Motordrehmoment bei $I_{max} = 50 A_{AC}$:	7 Nm mit $U_{Batt} = 48 V$
Getriebeübersetzung (SP81 LN):	1:50
Gesamte Übersetzung:	1:200
Encoderauflösung*:	4 Impulse/Umdrehung
Temperatursensor:	KTY84/130

Elektrische Spezifikation

EPS AC-W F07198:	36 / 48 V 70 A _{rms}
Minimale Batteriespannung:	35 V bei $U_{Batt} = 48 V$
Maximale Batteriespannung:	65 V bei $U_{Batt} = 48 V$
Maximaler Strom (36 / 48 V):	für 2 min (Alarm nach 5 s)
Stromaufnahme Steuerung:	max. 200 mA bei 24 V
Minimale Versorgungsspannung (Key) nach dem Einschalten:	12 V
Sicherungswert Netzsicherung:	40 A 58 V



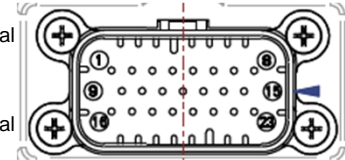
When assembling the plastic gear, align it so that the hole (marked in red) is exactly to the right (90°) when the drive wheel is traveling straight ahead (possibly aligned with slot)



- 1) Tighten screw **a** (M8x45) with 5Nm, then loosen by 1/8 turn and Lock
- 2) Tighten screw **b** (M12 x35) with 3Nm
- 3) Tighten screw **c** (M12x35) tightly
- 4) Tighten screw **b** tightly

PIN assignment ATECH steering

PIN	OM Steering M23	Description	Steering M23	Path	Remark
A1	CPOC1	1.st "Slider" Hall-Sensor; 0,5-4,5V (straight ahead 2,5V)	CPOC1	B7.PIN4 => M23.A1	Trace B steering signal
A2	CPOC2	2.nd "Slider" Hall-Sensor; 4,5-0,5V (straight ahead 2,5V)	CPOC2	B7.PIN3 => M23.A2	Trace A steering signal
A3	PBATT		+36V	G1.X1PIN(P) via current bar => F8 => before K1.PIN(K3/1) via current bar => F9 => W3.XS71 => M23.A3	Power supply steering unit
A4	PBATT		+36V	G1.X1PIN(P) via current bar => F8 => before K1.PIN(K3/1) via current bar => F9 => W3.XS71 => M23.A4	Power supply steering unit
A5	PBATT		+36V	G1.X1PIN(P) via current bar => F8 => before K1.PIN(K3/1) via current bar => F9 => W3.XS71 => M23.A5	Power supply steering unit
A6	NBATT		0V	X43PIN(B/2) => W3.XS70 => M23.PIN6	Gound supply steering unit
A7	NBATT		0V	X43PIN(B/2) => W3.XS70 => M23.PIN7	Gound supply steering unit
A8	NBATT		0V	X43PIN(B/2) => W3.XS70 => M23.PIN8	Gound supply steering unit
A9	PTFD	Overload and short circuit proof positive circuit breaker for the Hall sensor max. 2A	PTFD	M23.A9 => B7.PIN5	Power (12V?) for braking magnet (Steering resistance)
A10	NTFD	Overload and short circuit proof negative circuit breaker for the Hall sensor max. 1.3A	NTFD	M23.A10 => B7.PIN6	Ground for braking magnet (Steering resistance)



PIN	OM Steering M23	Description	Steering M23	Path	Remark
A11	SW2	Digital input NPN-Sensor (0,5-4,5V?) (straight ahead 2,5V?)	SW2	B8.PIN3 => M23.A11	Trace 2 (redundant) steering signal
A12	SW1	Digital input NPN-Sensor (4,5-0,5V?) (straight ahead 2,5V?)	SW1	B8.PIN2 => M23.A12	Trace 1 (redundant) steering signal
A13	GND		0V	M23.A13 => B8.PIN1	Ground (redundant) steering signal
A14	PCOIL2	Short-circuit-proof positive circuit breaker for a proportional coil max .0.7A	+24V Out	M23.A14 => W3.XS35 => a) K9.PIN2(30) + b) K9.PIN3(87c) + c) K4.PIN1(30b)	Safety function for emergency braking in the event of steering failure
A15	KEYIN	Key switch input (logic supply)	HS GND	G1.X1PIN(P) via current bar => F2 => before K1.PIN(K1/1) => W3.XS1 => F1 => S1.PIN1 (if switched) => S1.PIN2 => W3XS5 => M23.A15	Switched power (key switch)
A16	//	//	//	//	
A17	+5V	Output 5V, 50 mA supply (positive supply for CPOC1- 2)	+5V	M23.A17 => B7.PIN1	5V supply for steering angle sensor
A18	VCC2		//	//	
A19	GND		0V	M23.A19 => B7.PIN2	Ground for steering angle sensor
A20	//	//	//	//	
A21	VCC1	Output 5V 50 mA supply	+5V 50mA	M23.A21 => B8.PIN4	5V supply for (redundant) angle sensor
A22	CANL1	No 120Ω terminating resistor	CAN_L	A1.X18PIN3 => W3.XS23 => W3.XS26 => W3.XS73 => M23.A22	
A23	CANLH1	No 120Ω terminating resistor	CAN_H	A1.X18PIN7 => W3.XS15 => W3.XS27 => W3.XS72 => M23.A23	

Configuration settings

The configuration settings in chapter 5 must be selected as follows :

running number > 1000 =>

Chapter	Configuration	Content	Description
5	4	2	Steering controller from ATECH
5	6	1	Brake wear sensor present

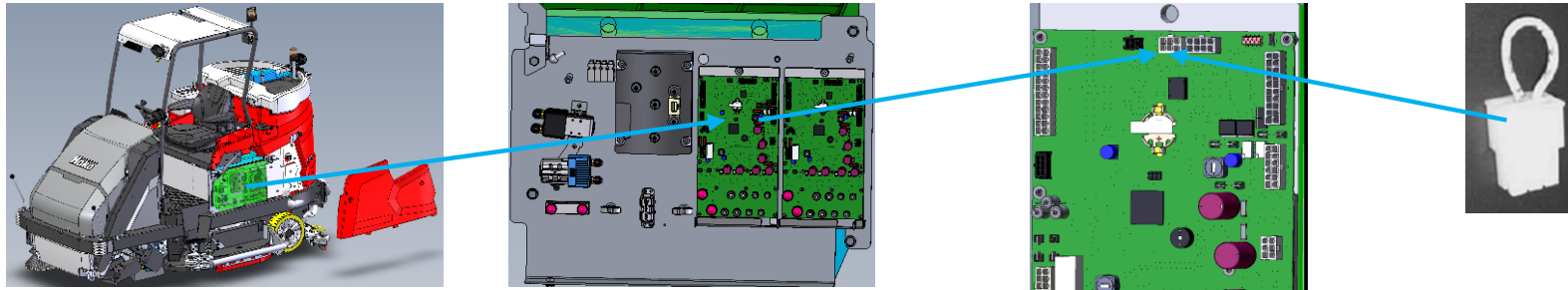
For machines between serial numbers 1000 to 1499, the sensor is simulated by the voltage divider 01389880

Calibrate steering

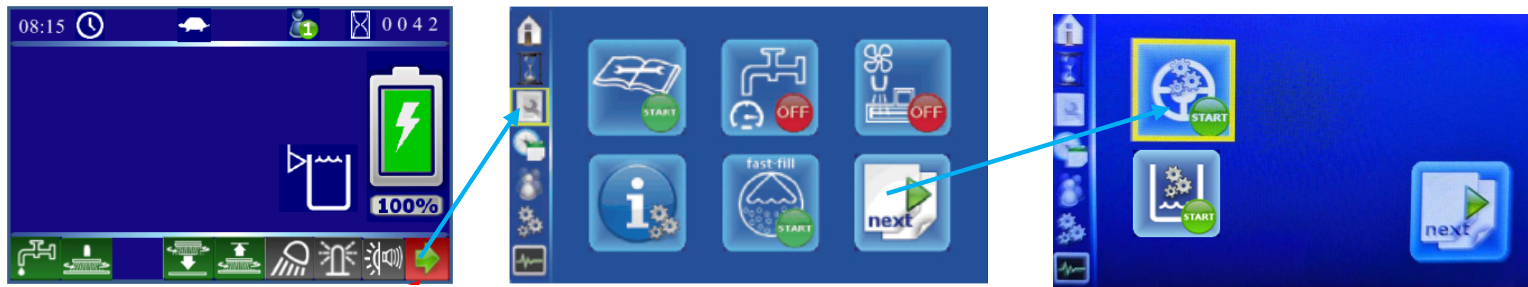
If the steering unit is exchanged, a calibration must be carried out.

- 1) Remove side and electronic cover
- 2) Connect diagnostic connector 03006790 to connector X20, at board A1
- 3) Switch on the machine with the key switch
- 4) Carry out calibration in the display menu
- 9) Pull out the diagnostic connector again

1.)



4.)



Calibration angle sensor B8:

5) Turn steering wheel to the left up to the stop



6) Then turn steering wheel to the right until to the stop



Calibration angle sensor B7:

7) Then straighten steering wheel



8) Now actuate the turn-push button



Calibration successful



Calibration unsuccessful

The calibration process may fail;

- if the 30 s timer per sensor calibration is exceeded
=> Repeat calibration (in time)
- the angle sensor does not transmit any angle change
=> Check angle sensors, wiring and controls and repeat calibration

After calibration, check the steering. To do this, drive a short distance (approx. 10 meters) with alternating steering movements (steer left and right).

If the steering wheel is not aligned straight when driving straight ahead =>

Solution:

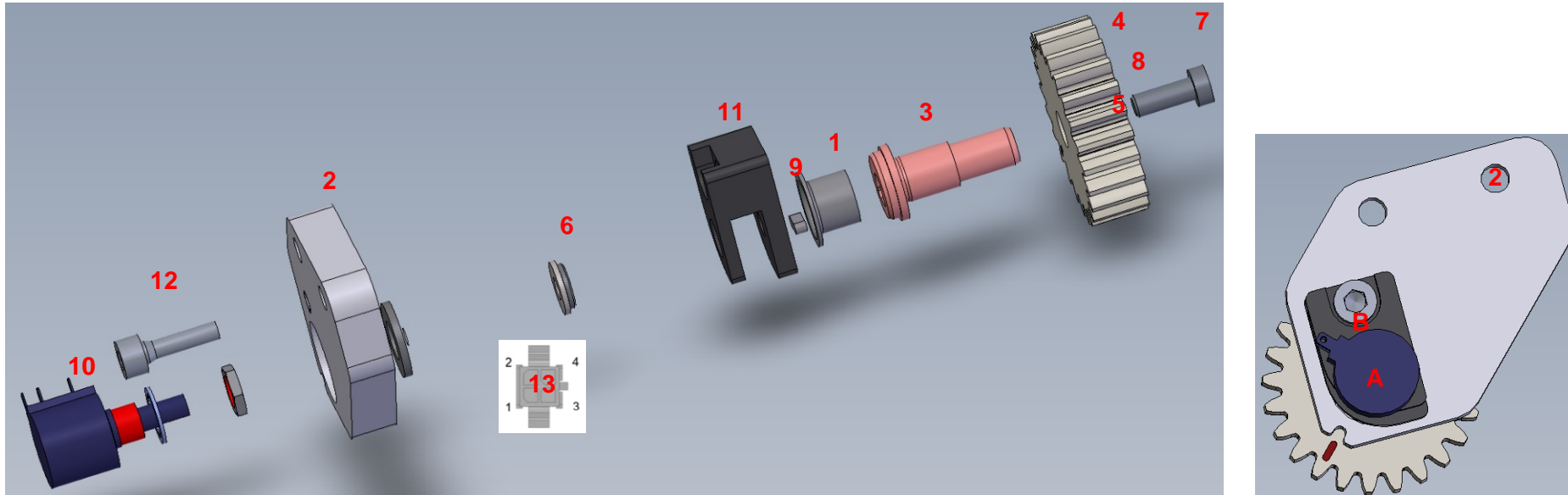
- Note the size of the deviation
- Restart calibration process
- When calibrating (part 2) steering angle sensor B7, “mirror” the deviation of the steering wheel alignment

Example:

Steering wheel points 10 degrees to the left after driving straight ahead

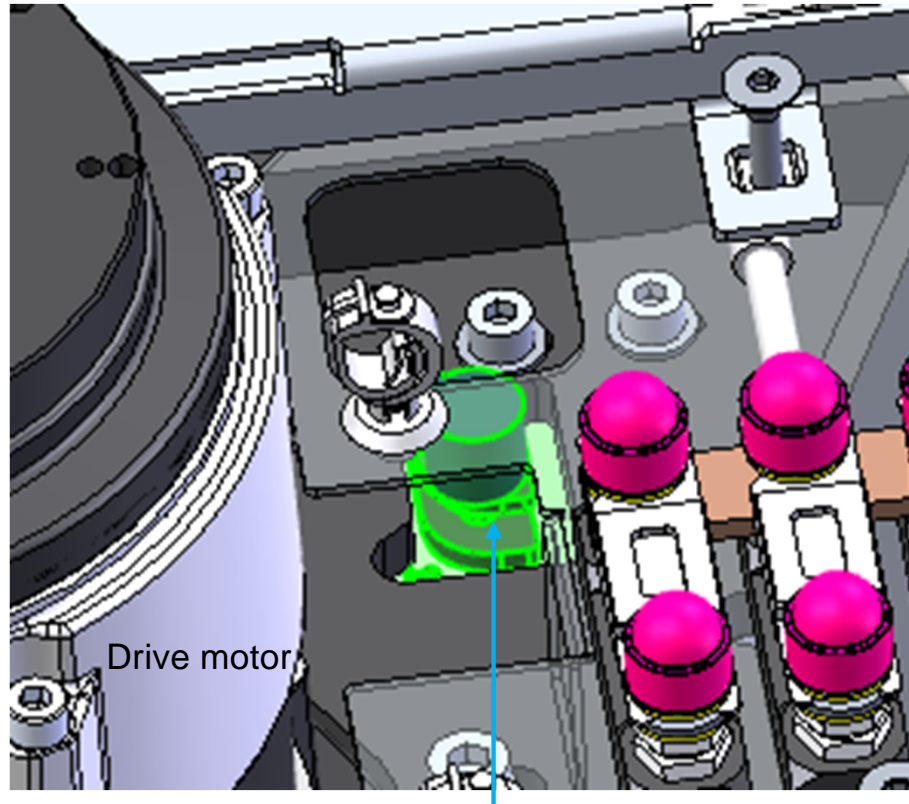
=> Align the steering wheel approx. 10 degrees to the right

Additional steering angle sensor for rear-wheel drive



1. Drive the DU socket (1) into the base plate (2) using a drive-in socket.
2. Insert shaft (3) into DU socket.
3. Disc (4); Press gear (5) and washer (6) onto shaft (3).
4. Mount screw (7) and washer (8). (Bolt adhesive medium strength e.g. Loctite type 243 / tightening torque 9Nm)
5. Insert the key (9) and grease the upper end of the shaft to protect against corrosion. (e.g. Mobilgrease MB2)
6. Screw the sensor support (11) with the rotary potentiometer (10) onto the base plate (2) using the screw (12). (Bolt adhesive medium strength e.g. Loctite type 243 / tightening torque 9Nm)
7. Set the resistance value of 2.5 kOhm at pin 2 (brown) and pin 3 (black) of the connector (13) of the rotary potentiometer (10) by turning the gear wheel.
8. Mark the tooth aligned with groove (B) with a line (A).
9. Secure gear position with adhesive strips.
10. Marked tooth A must point to groove B after installation with drive wheel aligned straight.

Installation position of rotation angle sensor

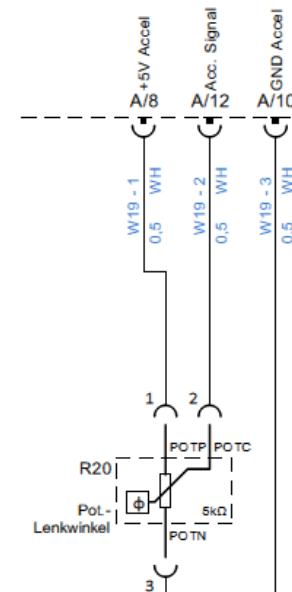
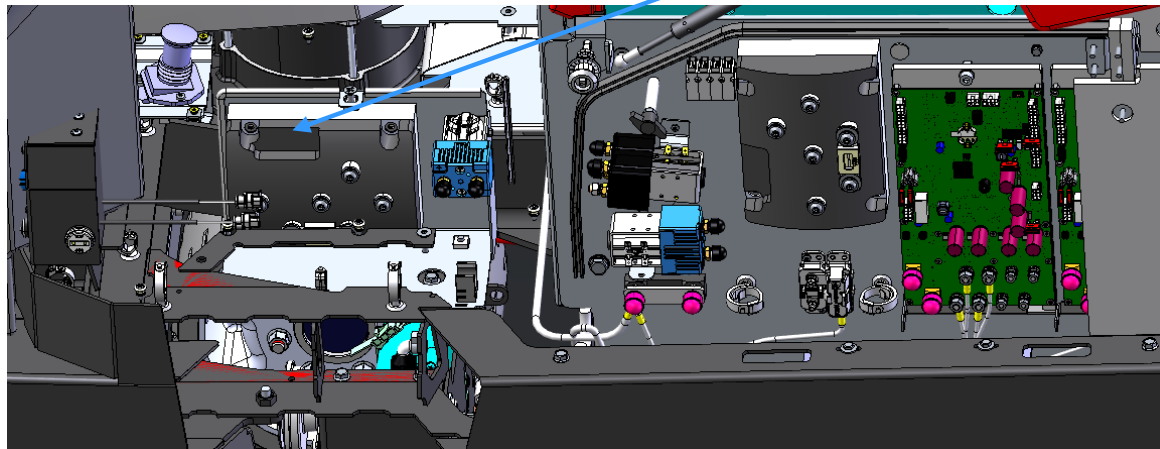


Middle base plate
and electrical cover
removed

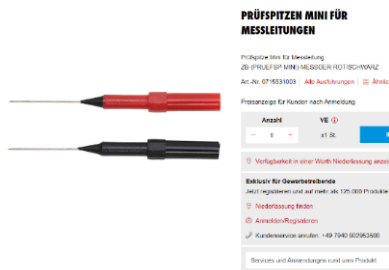
Drive motor

Completely assembled rotation angle sensor

On rear wheel drive controller A05 connector A



A steering angle outside of 1.85V to 3.15V results in rear drive being switched off!



Use the above measuring tip or similar to measure

Steering in middle position

Between A12 (Acc. Signal) and A10 (GND) => 2.5V
 Between A12 (Acc. Signal) and A8 (+5V) => 2.5V
 Both must have the same (average) value