

**Centre for Artificial Intelligence and Robotics (CAIR), DRDO, Bengaluru-93.**

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**DATA SHEET- WAIST ASSISTIVE POWERED EXOSKELETON**

**November-Monthly report**

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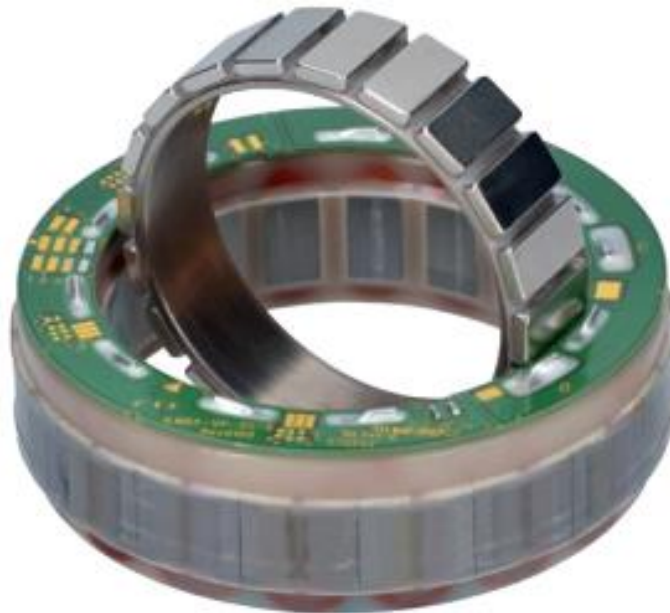
**OBJECTIVE:**

To get the data sheet for the ILM-70x18 motor, HFUS-2SH-20 Gear drive and choose a suitable encoder for the Waist assistive powered Exoskeleton for bending, lifting and shifting during load carrying activity.

**1. Motor: ILM 70x18**

Details & Data sheet:

- Frameless motors for highest design flexibility
- Available with integrated safety brakes and encoders
- Hollow-shaft capability
- Extra-low voltage 12 V - 48 V
- Company Name: **TQ-RoboDrive, Germany, [1].**



**Figure.1. Motor: ILM 70x18**

**Table.1. DATA SHEET: Motor: ILM 70x18**

Specifications	Units
Max Power	270 [W]
Rated voltage $U_r$ *	48 [V]
Rated torque $T_r$ *	1.24 [Nm]
Peak torque $T_{max}$ at 20% deviation from linearity	4.05 [Nm]
Max rotation speed $n_{max}^{**}$ at $U_r$	7,340 [rpm]
Diameter D	69 [mm]
Length L	30.5 [mm]
Weight m	330 [g]
Number of pole pairs	10
Rotor inertia J	0.321 [kgcm <sup>2</sup> ]
Nominal operational temperature of the stator	-40°C to 125°C
* At nominal current. Thermal behavior is strongly dependent on installation situation.	
** Theoretical no-load rotation speeds at $U_r$ . Variations can arise from operation with different inverters.	
*** Max rotation speed due to mechanical structure.	

**Web Address:** [https://www.tq-group.com/filedownloads/files/products/robodrive/data-sheets/en/DRVA\\_DB\\_Servo-Kits\\_ILM\\_EN\\_Rev408\\_Web.pdf](https://www.tq-group.com/filedownloads/files/products/robodrive/data-sheets/en/DRVA_DB_Servo-Kits_ILM_EN_Rev408_Web.pdf)

## 2. Encoder: RD70-AKSIM

Details & Data sheet:

- Absolute magnetic multiturn encoder with hollow-shaft design.
- RD70-AKSIM encoders provide accurate absolute position data with high resolution for the precise, efficient control of TQ-RoboDrive servo motors. The encoders feature highly robust magnetic ASIC sensors, providing significantly better resistance to dust, dirt and other disruptive elements. Multiturn cycle information is stored electronically but is not updated during motion when there is no power supply to the sensor.
  - ▶ Hollow-shaft capability
  - ▶ Flat off-axis system for space-constrained applications
  - ▶ Singleturn resolution up to 262,144 incs/rev (18 bit)
  - ▶ Multiturn resolution 65,536 revs (16 bit)
  - ▶ Absolute accuracy  $\pm 0.1^\circ$ , repeatability  $0.002^\circ$ , no hysteresis
  - ▶ High speed operation up to 10,000 rpm
  - ▶ Differential BiSS-C interface (update rate 28 kHz)
  - ▶ Sampling rate 18 kHz
  - ▶ Dimensions adapted to corresponding TQ-RoboDrive servo kits

- Company Name: **TQ-RoboDrive, Germany, [2].**



**Figure.2. Encoder: RD70-AKSIM**

**Table.2. DATA SHEET: Encoder: RD70-AKSIM**

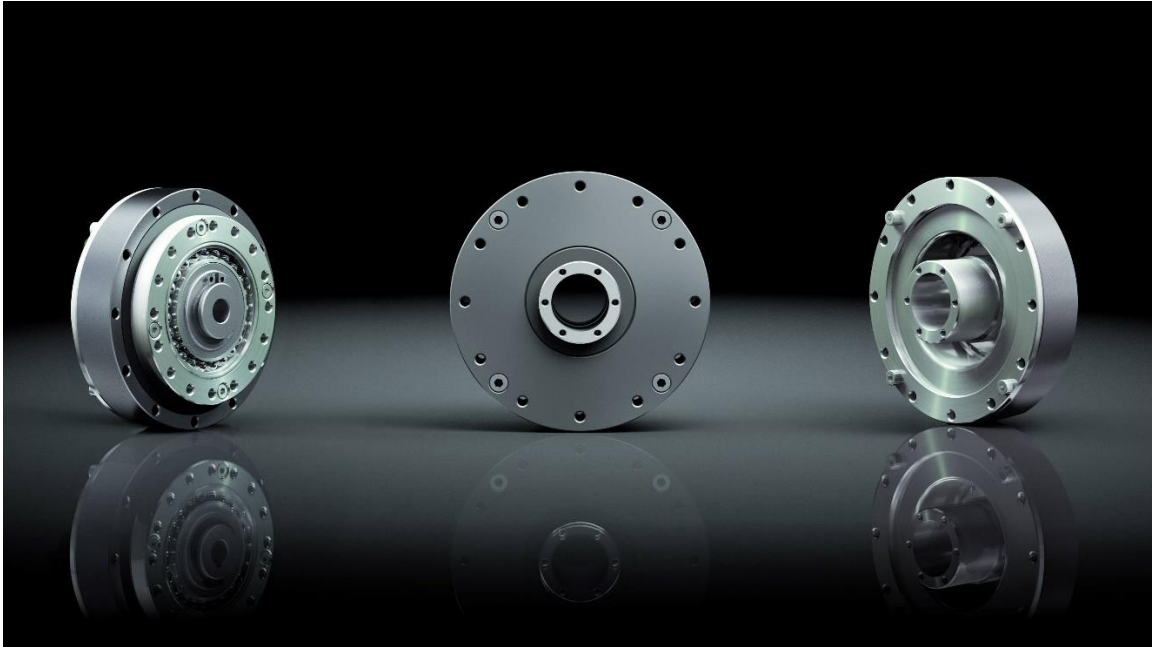
<b>Specifications</b>	<b>Units</b>
Singleturn resolution	262,144 (18 bit) [incs/rev]
Multiturn resolution	65,536 (16 bit) [revs]
Accuracy	±0.1 [deg]
Repeatability	0.0014 [deg]
Sampling rate fs	18 [kHz]
Maximum rotation speed nmax	7,000 [rpm]
Maximum acceleration amax	60,000 [rad/s <sup>2</sup> ]
Sensor PCB diameter D	74 [mm]
Sensor length L	9.2 [mm]
Weight m	19.8 [g]
Inertia J	0.070 [kgcm <sup>2</sup> ]
Operational temperature range	-40°C to +105°C
Supply voltage Udd	5 [V]
Supply current Idd	150 [mA]
Communication interface*	BiSS-C differentia

**Web Address:** [https://www.tq-group.com/filedownloads/files/products/roboDrive/data-sheets/en/DRVA\\_DB\\_Sensors\\_RD50-70-85-AKSIM\\_EN\\_Rev404\\_Web.pdf](https://www.tq-group.com/filedownloads/files/products/roboDrive/data-sheets/en/DRVA_DB_Sensors_RD50-70-85-AKSIM_EN_Rev404_Web.pdf)

### 3. Gear Drive: HFUS-2SH-20

Details & Data sheet:

- Simplicity Unit with hollow shaft.
- Supplied with no lubrication.
- Manufacturer: **Harmonic Drive AG, [3]**.



**Figure.3. Gear drive: HFUS-2SH-20**

**Table.3. DATA SHEET: Gear Drive: HFUS-2SH-20**

Specifications	Units
Size	20
Outer Diameter	90 [mm]
Reduction ratio	50
Max. Continuous torque	34 [Nm]
Peak repetitive torque	56 [Nm]
Hollow shaft diameter	21 [mm]
Transmission accuracy	1 arc. min.
Mass inertia	404 [gcm <sup>2</sup> ]
Max. Continuous input speed	1100 [rpm]
Max. intermittent input speed	6500 [rpm]
Inertia J	0.070 [kgcm <sup>2</sup> ]
Recommended temperature range	0...+60°C
Weight	1380 [g]

**Web Address:** <https://innodrive.ru/en/catalog/harmonic/gear/9299/>

Reference:

[1] Data sheet for ILM70x18

[2] Data sheet for RD70-AKSIM

[3] Data sheet for HFUS-2SH-20

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