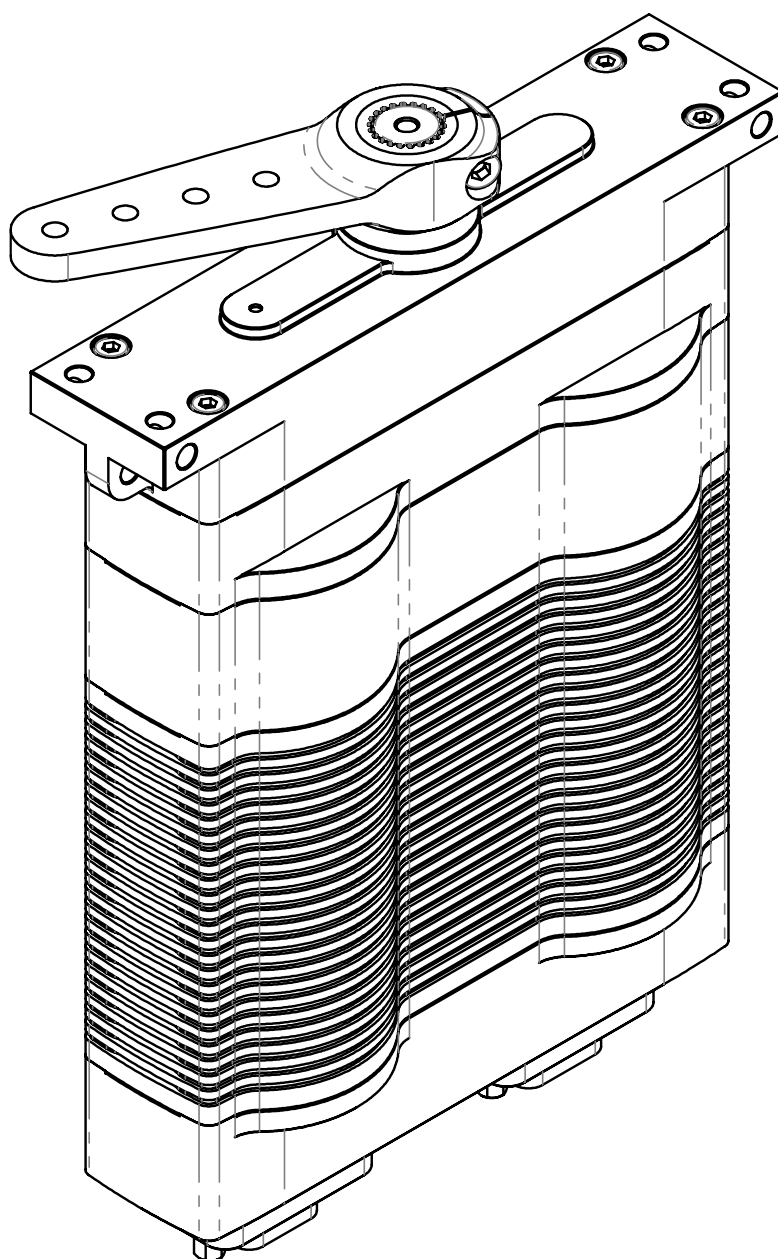


## DA 30-HT-Duplex Technical Specification



DA 30-HT-D-30-5848

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## **1. General Description**

The fully redundant DA 30 High Torque series has been developed for applications that require a very reliable actuator operation. The redundant – two channel – design of the actuator allows continuing to operate even if one channel of the two channels has failed. All major components such as the electric motors, control and communication electronics and power supply are available twice. The position sensor is even featuring a three-channel design (2 out of 3 voting).

### **1.1 Description of Redundancy Concept**

The actuator redundancy concept is based on a so-called “Command-Monitor Architecture”. This means that the primary channel of the actuator (communication interface, control electronics, position information) is being in command of the actuator. Example: the set-point command is being received by the primary communication interface and will be processed by the primary control electronics using the data of the primary position sensor. The result of this processing will be used to drive the primary and secondary motor. The secondary control electronics will constantly monitor the correctness of this processing. The secondary control electronics will reject the processing result coming from the primary electronics if its own processing of the data is yielding a different result. In this case the secondary control electronics will continue to use its own processing results to drive the electric motor. The same mechanism applies to switching from the primary communication channel to the secondary communication channel. Switching from primary (processing and communication) can be forced in order to test both channels.

In case of hardware failure (electronics or motor) the actuator will continue to function at degraded performance as only one of the two electric motors will be delivering torque (degraded mode). The remaining performance (torque) is reaching approximately 40% of the nominal rated torque, as the gear train of the failed channel is back drivable and will only consume a fraction of the torque that is being produced by the remaining functioning channel.

The actuator additionally features a redundant power supply concept. The two power supply inputs are being monitored by both control electronics. The control electronic boards do also have additional diagnostic sensors such as: current, motor temperature, printed circuit board temperature and humidity. All this diagnostic data can be read via the communication interface to derive load and health information. In addition the actuator is counting the time of operation and the time at different load levels (idle, <25% load, <50% load, <75% load, and <100% load).

## 2. Operating Data

		Standard Mode	Degraded Mode
Supply Voltage (rated)		28 V DC	
Supply Voltage Range		12 ... 32 V DC	
Standby Current <sup>1,2</sup>	at rated voltage	0.1 A	0.1 A
Rated Current <sup>1,2</sup>	at rated voltage	4.5 A	2 A
Peak Current <sup>1,2</sup>	at rated voltage	7.8 A	N.A.
Rated Torque <sup>1</sup>	at rated speed	36 Nm (318.6 lbf-in)	14 Nm (123.9 lbf-in)
Peak Torque <sup>1</sup>	at rated voltage	64 Nm (566.4 lbf-in)	26 Nm (230.1 lbf-in)
No Load Speed <sup>1</sup>	at rated voltage	165 °/s	<100 °/s
Rated Speed <sup>1</sup>	at rated torque	115 °/s	<75 °/s
Default Travel Angle		±45° = 90° total travel	
Max. Travel Angle		±85° = 170° total travel	
Backlash (mechanical)		≤ 0.6°	
No-load Position Error under Temperature <sup>3</sup>		≤ ±1°	
Operating Temperature Range <sup>4</sup>		-30°C ... +70°C (-22°F ... +158°F)	
Storage Temperature Range		-35°C ... +80°C (-31°F ... +176°F)	

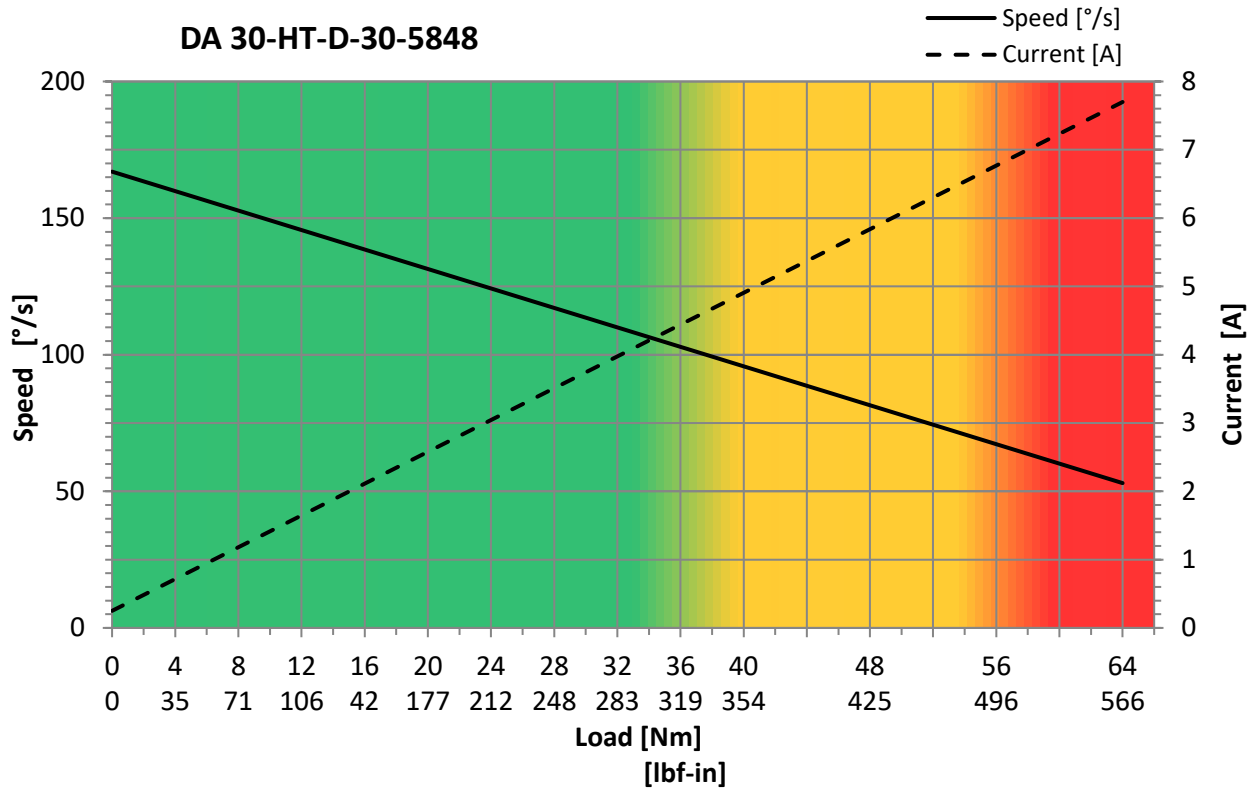
1) Tolerance ±10%

2) Summarized Current Consumption in Standard Mode

3) -20°C ... +50°C , Δt = 70°C (-4°F ... +122°F , Δt = 126°F)

4) Low Temperature Modification (-70°C / -94°F) on request

### 3. Performance



#### Operation Mode:

■ Continuous

■ Short Time  
< 10s , 60s cool down

■ Overload  
< 1s , 60s cool down

**Degraded Mode:** see Operating Data

#### 3.1 Degraded Mode

In case one motor and/or the related electronics fail, the output shaft is driven by the remaining motor. This operation mode is called Degraded Mode, as the remaining performance is degraded. The actuator needs to be replaced whenever the actuator switched to Degraded Mode.

## 4. Redundant Command Interface

Baud-Rate	115200 bit/s $\pm 1.5\%$
Protocol <sup>5</sup>	6 Byte Command Frame with 16 bit CRC
Resolution	0.1°

5) Documentation available

### RS 485 Redundant Command Interface

The RS 485 compatible communication interface is intended to operate the actuator using a six-byte protocol with a baud rate of 115,200 bit/s. All command and reply messages are secured by a 16 bit Cyclic Redundancy Checksum (CRC). Parameters like the actual output shaft position and other diagnostic information can be read from the actuator via this interface.

Detailed information is provided in the RS 485 documentation.

### Firmware Adaptation / Non-Recurring Engineering

There are certain rules to be implemented together with the customer to allow best possible integration into the customer's system architecture. This includes the rule for the monitoring motion controller taking over the command from the motion controller currently in command if there is false data coming from the controller in command. This is strongly influenced by the way the customer wants to talk to the servo from the flight control computer or autopilot (e.g. is there one AP or a primary AP and a backup AP, etc.). Volz recommends to discuss all these topics in a workshop to create the specification of the "switching rules" etc. Ideally, there would be staff present from customer's flight control computer/AP team.

## 5. Materials and Protective Features

Case Material	Saltwater resistant Aluminum Alloy
Splash Water Resistance	IP 67
Case Surface Treatment	HART®-Coat
Salt Water Resistance	>100 hrs.
EMI / RFI Shielding	Case Shielding
Motor Type	Two Brushless DC Motors
Gear Set Material	Hardened Steel
Position Sensor	Triple Sensor, contactless
Position Feedback	Standard
RS 485 Redundant Communication Interface	Standard
Humidity Sensor	Optional
Temperature Sensor	Standard on each Motor and PCB

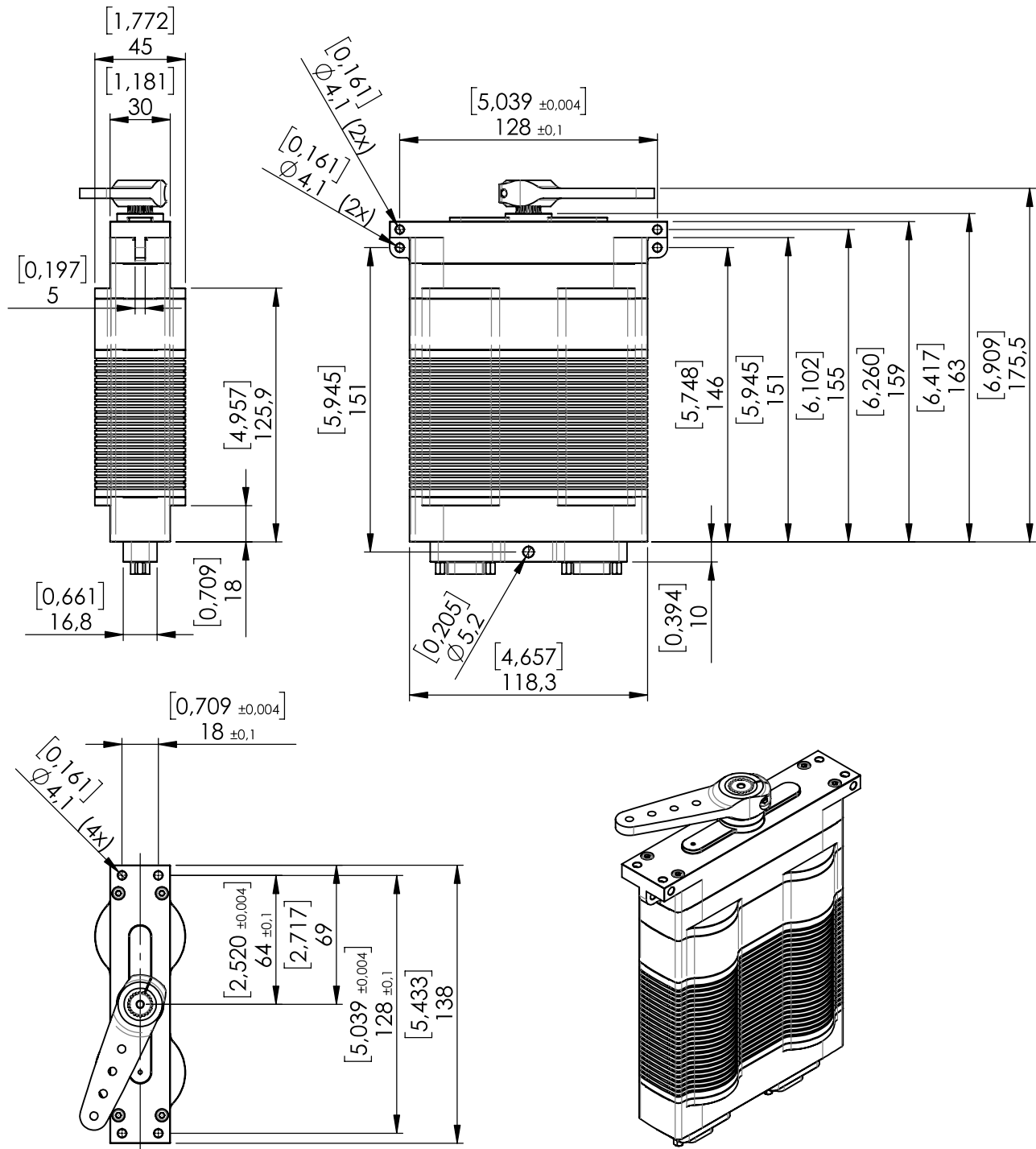
## 6. Dimensions

Case Dimensions	159 mm x 118.3 mm x 30.0 (45.0) mm 6.26 in x 4.657 in x 1.181 (1.772) in
Standard Tolerances	Unless otherwise specified according to DIN ISO 2768 - m
Weight (with DE-9m Standard Connectors)	1850 g (65.3 oz) ±10%
Weight (with MIL Grade D38999 Connectors)	1950 g (68.8 oz) ±10%

## 6.1 Installation Dimensions

DA 30-HT-D-30-5848...ST

DE-9m Standard Connectors



Not to scale

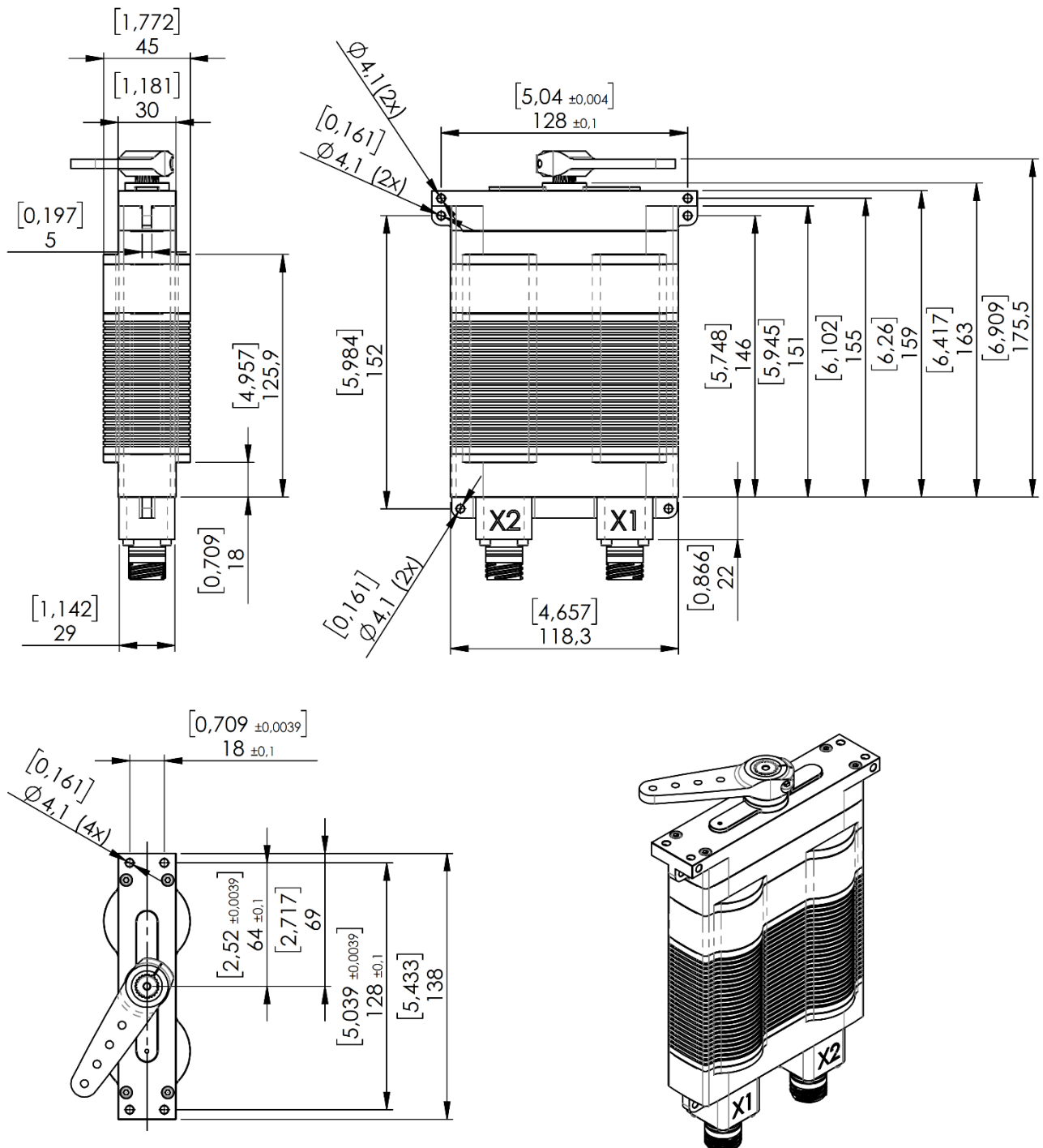
Dimensions: [in], mm

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DA 30-HT-D-30-5848.\_.MIL13  
MIL Grade D38999 Connectors



Not to scale

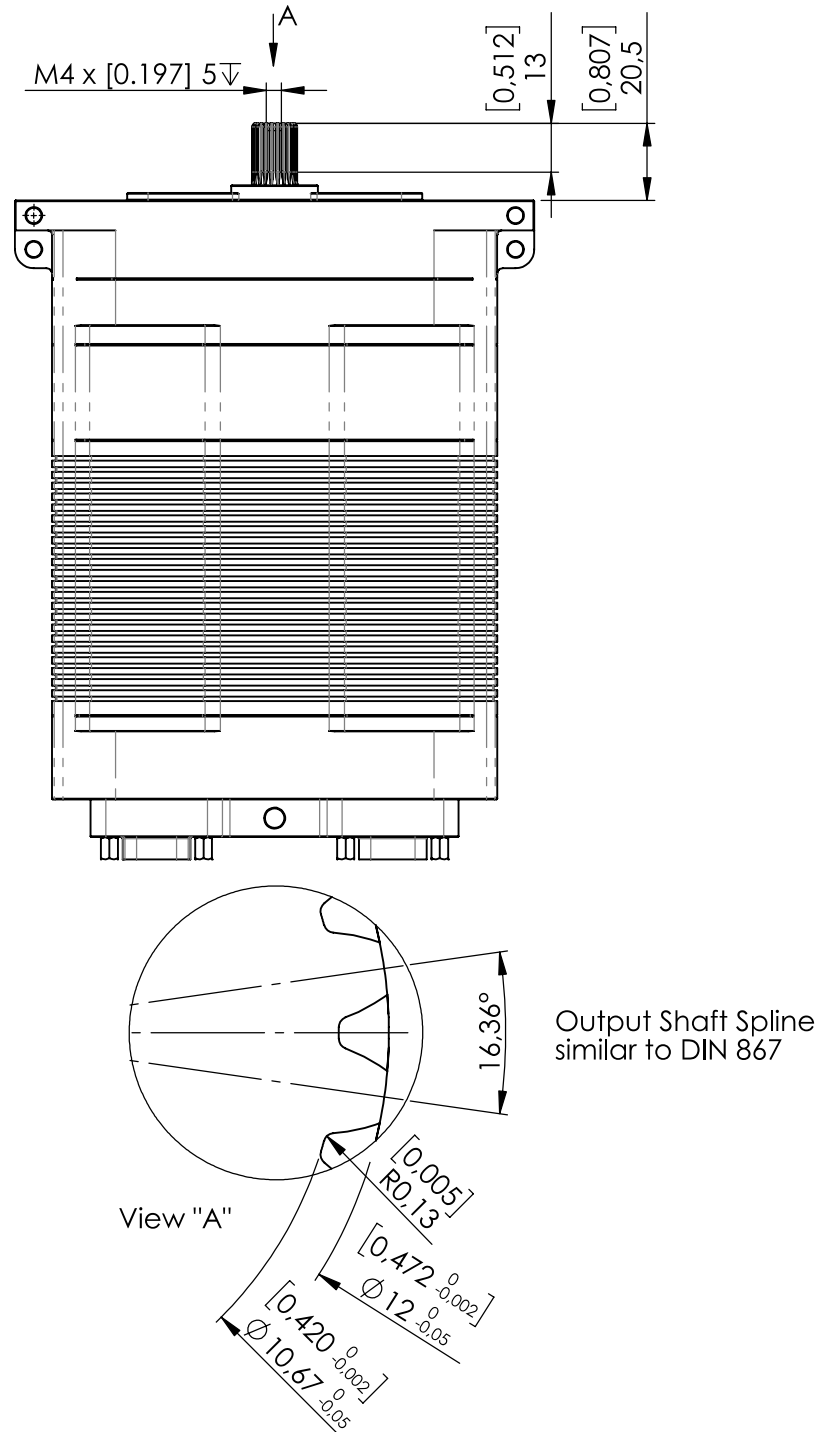
Dimensions: [in], mm

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Revision: F

## 6.2 Output Shaft Spline

Valid for all Versions  
DA 30-HT-D-30-5848...



Not to scale

Dimensions: [in], mm

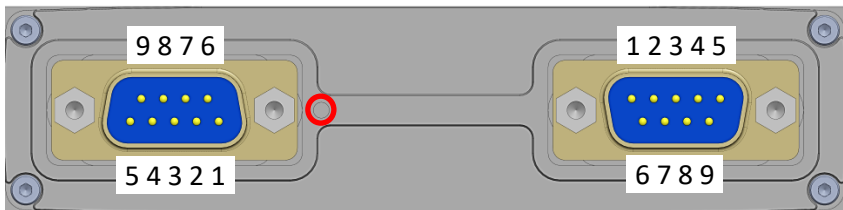
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## 7. Electrical Connection

### Two Integrated DE-9m Standard Connectors

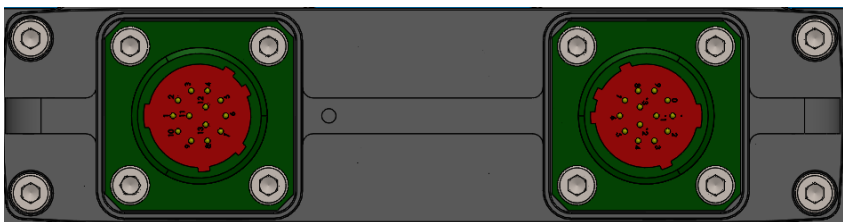
Item # DA 30-HT.D.30.5848.\_.ST

Standard Connectors					
X1			X2		
Manufacturer	ITT Cannon		Manufacturer	ITT Cannon	
Type	DEMM-9PE		Type	DEMM-9PE	
Mating	DE-9f		Mating	DE-9f	
<div><div>X1</div><div></div><div>X2</div></div>					
Pin Assignment					
X1 RS 485 Interface 1			X2 RS 485 Interface 2		
1	RS 485 A1	Non-inverting Input / Output	1	RS 485 A2	Non-inverting Input / Output
2	RS 485 B1	Inverting Input / Output	2	RS 485 B2	Inverting Input / Output
3	-	Do not connect	3	-	Do not connect
4	+V DC (1.2)	Power + (Backup)	4	+V DC (2.2)	Power + (Backup)
5	Case GND	Case Ground	5	Case GND	Case Ground
6	+V DC (1.1)	Power + (Primary)	6	+V DC (2.1)	Power + (Primary)
7	GND (1.1)	Power Return (Primary)	7	GND (2.1)	Power Return (Primary)
8	GND (1.2)	Power Return (Backup)	8	GND (2.2)	Power Return (Backup)
9	-	Do not connect	9	-	Do not connect

Alternative connectors on request.

Two Integrated MIL Grade D38999 Connectors

Item # DA 30-HT.D.30.5848.\_.MIL13

MIL13 D38999 Connectors					
X1			X2		
Manufacturer		Amphenol	Manufacturer		Amphenol
Type		D38999-20WB35PN	Type		D38999-20WB35PA
Mating		e.g. D38999-26WB35SN	Mating		e.g. D38999-26WB35SA
<div><div>X1</div><div>X2</div></div>					
Pin Assignment					
X1 RS 485 Interface 1			X2 RS 485 Interface 2		
1	NC	Do not connect	1	NC	Do not connect
2	PWR_1.1	Power Supply Input 1.1	2	PWR_2.1	Power Supply Input 2.1
3	NC	Do not connect	3	NC	Do not connect
4	COM1_1.1	COM1 A (RS 485)	4	COM2_2.1	COM2 A (RS 485)
5	COM1_1.2	COM1 B (RS 485)	5	COM2_2.2	COM2 A (RS 485)
6	CASE_GND_1	Case Ground	6	CASE_GND_2	Case Ground
7	COMI_1.1	COMi A (RS 485) / Do not connect	7	COMI_2.1	COMi A (RS 485) / Do not connect
8	COMI_1.2	COMi B (RS 485) / Do not connect	8	COMI_2.2	COMi B (RS 485) / Do not connect
9	NC	Do not connect	9	NC	Do not connect
10	PWR_1.2	Power Supply Input 1.2	10	PWR_2.2	Power Supply Input 2.2
11	NC	Do not connect	11	NC	Do not connect
12	GND_1.1	Return, Signal Ground 1.1	12	GND_2.1	Return, Signal Ground 2.1
13	GND_1.2	Return, Signal Ground 1.2	13	GND_2.2	Return, Signal Ground 2.2

Alternative connectors on request.

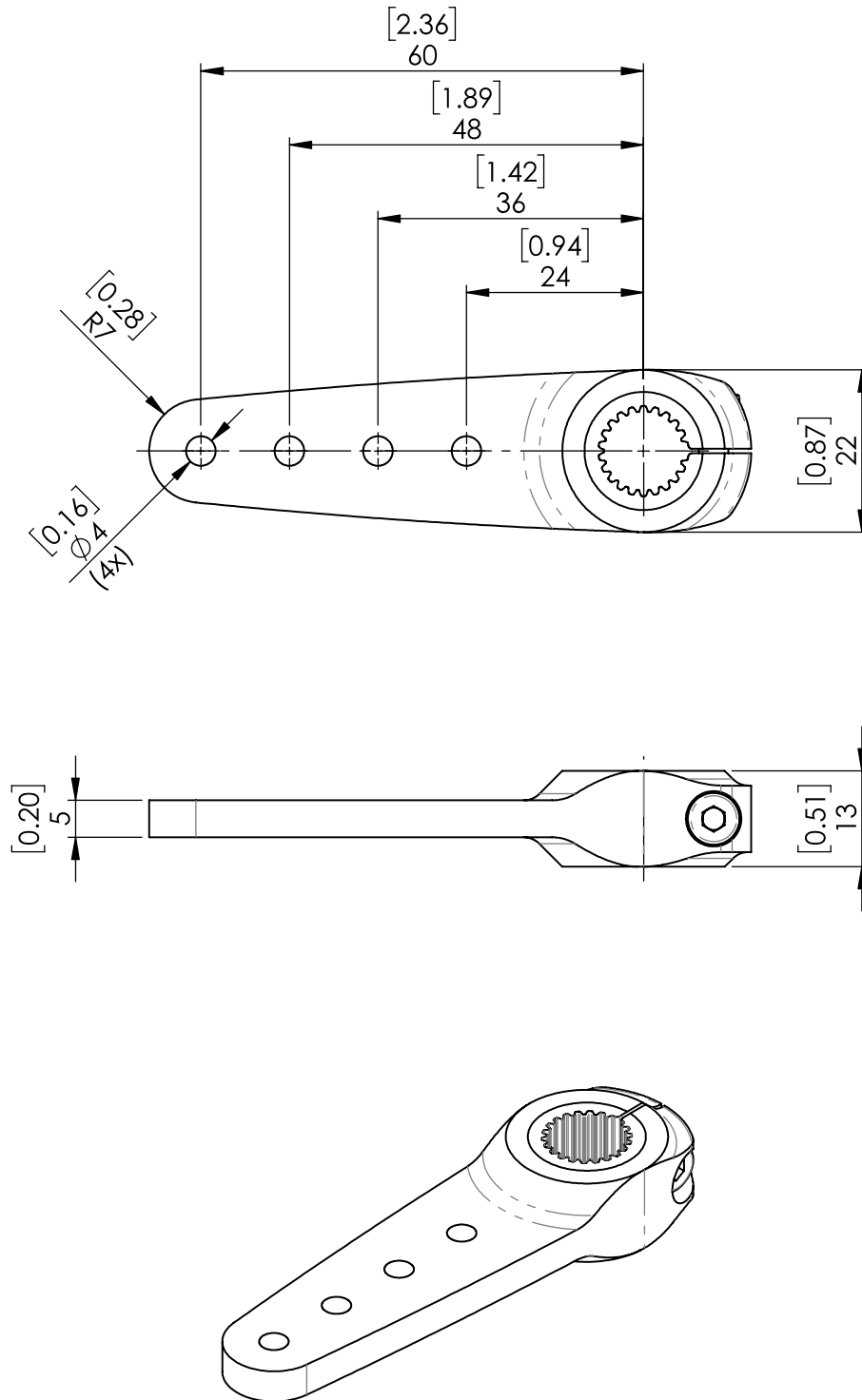
## 8. Accessories

Item	Item-No.
Aluminum Servo Arm	1951.21
Programming Tool RS-485	985.9

All accessories to be purchased separately.

## 8.1 Servo Arm

Item # 1951.21



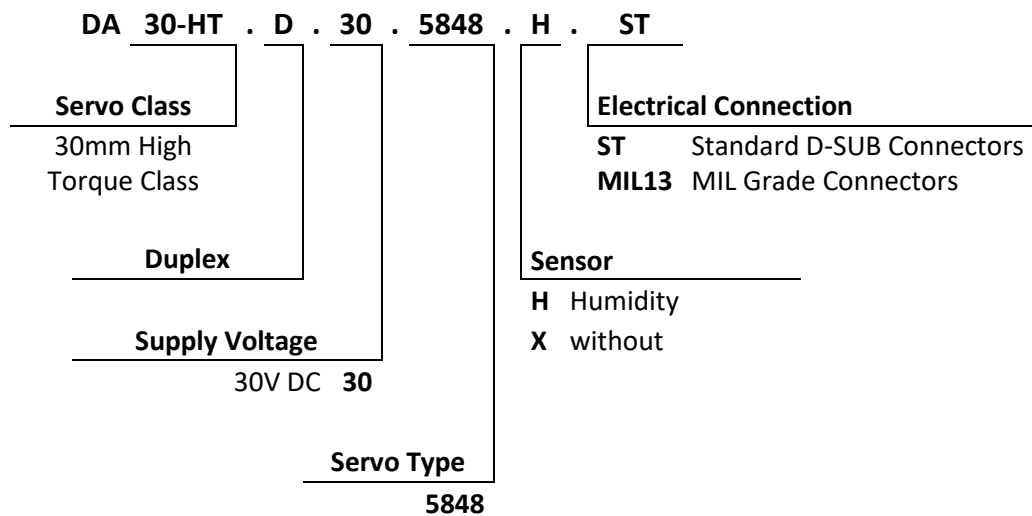
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Dimensions: [in], mm

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## 9. Item Number System



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