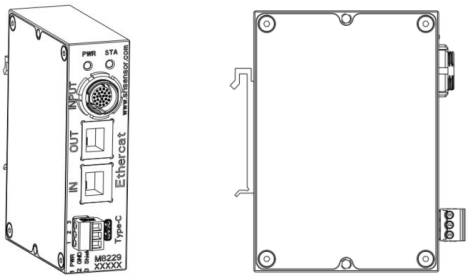
M8229 User's Manual

This document is the User's Manual for M8229, the interface box for the force/torque sensor (loadcell) manufactured by SRI (Sunrise Instruments Co., Ltd). It's strongly recommended that anyone who uses M8229 should read this document before any operation. Please do not hesitate to contact SRI if there is any question.

Content

1. Introduction

The interface box M8229 provides bridge excitation, signal conditioning, data acquisition and digital communication to the user's controller or PC via RS232, CAN Bus or Ethernet. A 24 bit sigma-delta AD converter (16 bit effective) is used to provide high resolution (1/5000 to 1/10000 of full scale) analog to digital converting. The data rate is up to 2 kHz. A 6 axis loadcell is connected to the interface box via a 19pin or a 22 pin connector.



Specifications:

- Analog
  - # of Channels: 6(for M8229S1) or 9(for M8229B1)
  - Programmable gain
  - Automatically adjusting sensor's zero offset
  - Low noise instrumentation amplifiers

- Digital
  - RS232(USB) , EtherCAT
  - 24 bit sigma-delta ADC (16 bit effective), Sampling rate: 10 ~ 2000 Hz
  - Resolution: 1/5000 to 1/10000 of full scale
  - Programmable system parameters

- Frontal Panel
  - Loadcell connector: FGG.2B.319 or FGG.XB.322
  - Digital: RJ45(EtherCAT)、USB Type-C (UART)
  - Power supply: 12 to 36V, 200mA.
  - Indicated lights: Power & Status

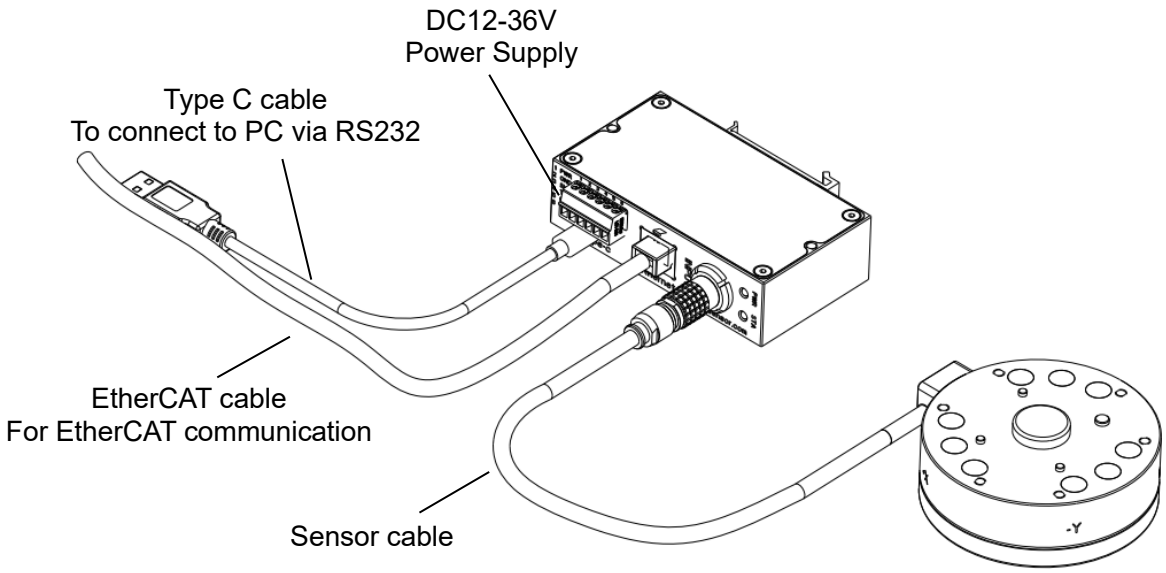
- Software
  - iDAS RD: Debugging software to display real-time sampling curve.
  - Open communication protocol
  - The dictionary file(*.xml) is supplied, can be connected into EtherCAT easily.

Selection Guide:

Model Type	# of Channels	Connector
M8229B1	9	FGG.XB.322
M8229S1	6	FGG.2B.319

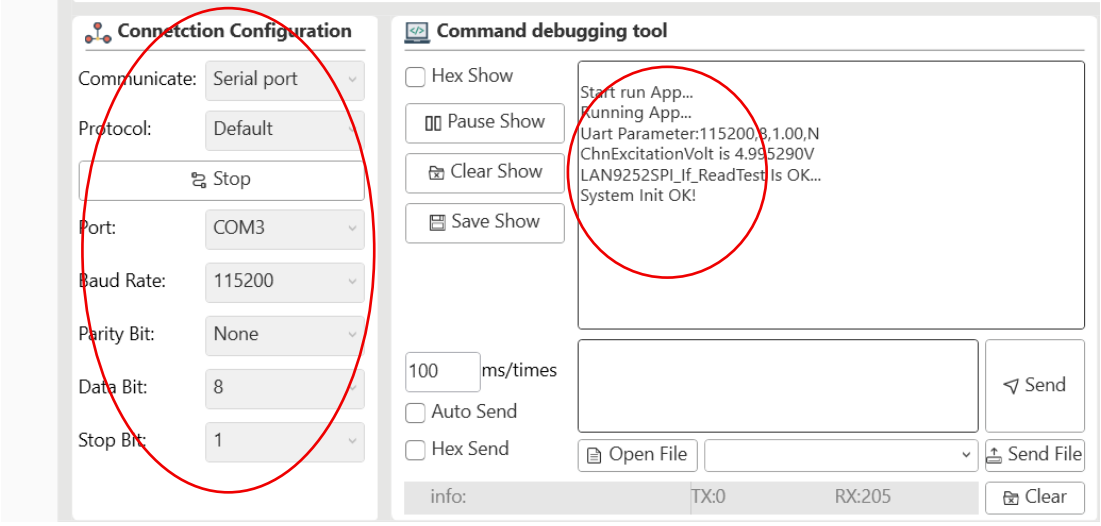
2. Quick Start

1). Connect the loadcell to M8229 via a LEMO connector.
2). Connect M8229 to PC via RS232/EtherCAT.
3). Provide 12-36V DC power supply (not included) to the interface box M8229.
（Note, if the out put of power module has a separated -V and GND, it's recommended to connect -V to GND. This way is helpful to reduce noise of sampling data.）

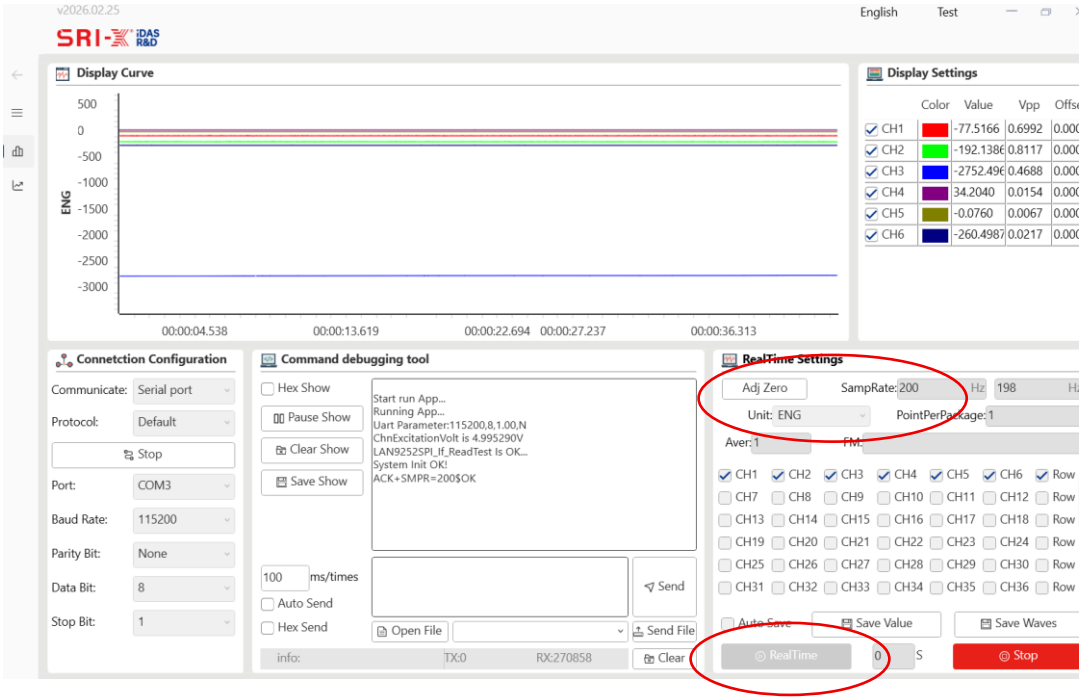


2.1 RS232 communication

Step1: Run iDAS R&D.exe. Then select PortName and BaudRate, and click "Connect" to connect to serial port.When connect successfully, the button will switch to "Stop".
Step2: Turn power on. Initialization information will appear in the information box.



Step 3：Select Eng in the “Unit” box, check CH1~CH6 boxes to represent FX, FY, FZ, MX, MY, MZ, then click “RealTime” button to start obtaining real-time force curves.



Note:

With RS232 communication, SampRate is up to 300 Hz for 6-channel data upload and 1 kHz for 1-channel data upload at BaudRate 115200bps.

With Ethercat communication, SampRate is up to 2K Hz for 6-channel data upload

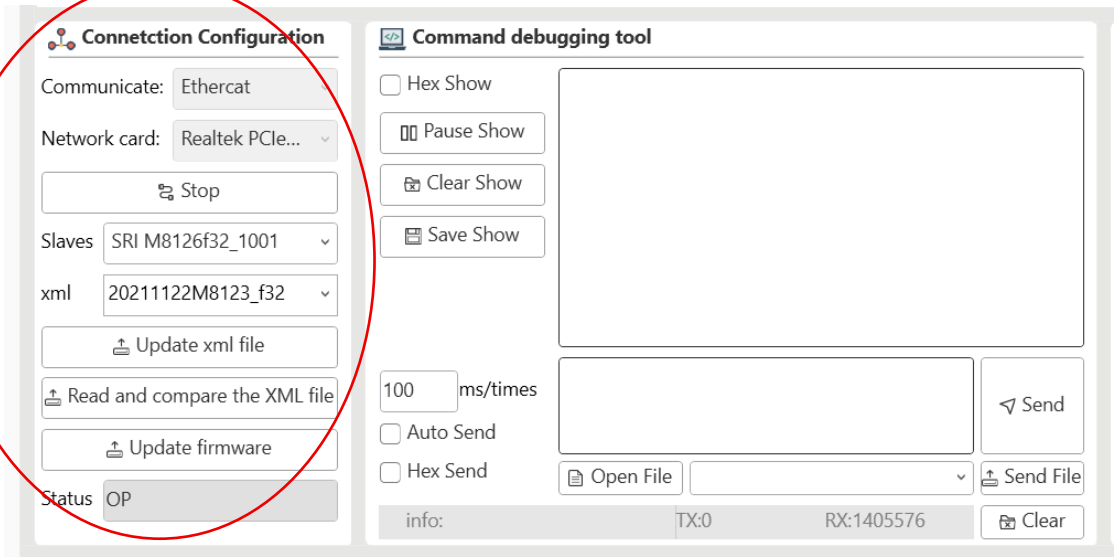
.

If the real-time data shown by iDAS R&D is incorrect, please click Stop and send Commands DCPM and DCPCU to make sure that current matrix coefficients and calculation unit match the sensor calibration report.

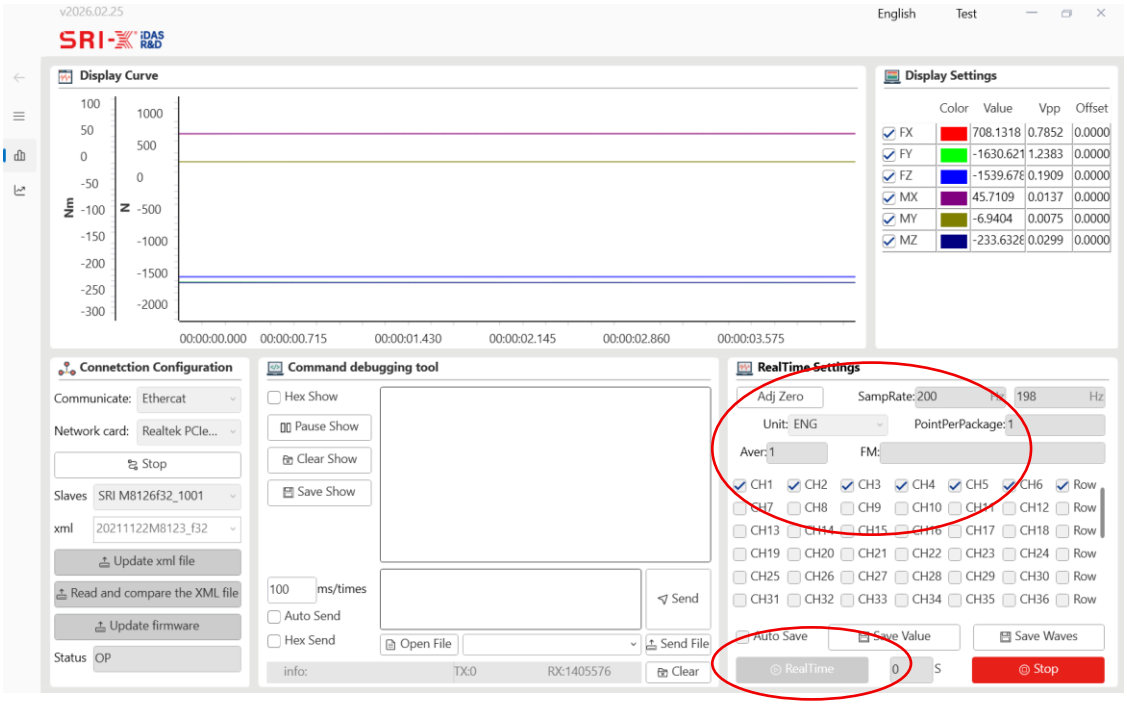
2.2 EtherCAT communication

Step 1: Run iDAS R&D.exe. Then set Communicate to EtherCAT, select Network card (your PC's Ethernet card).

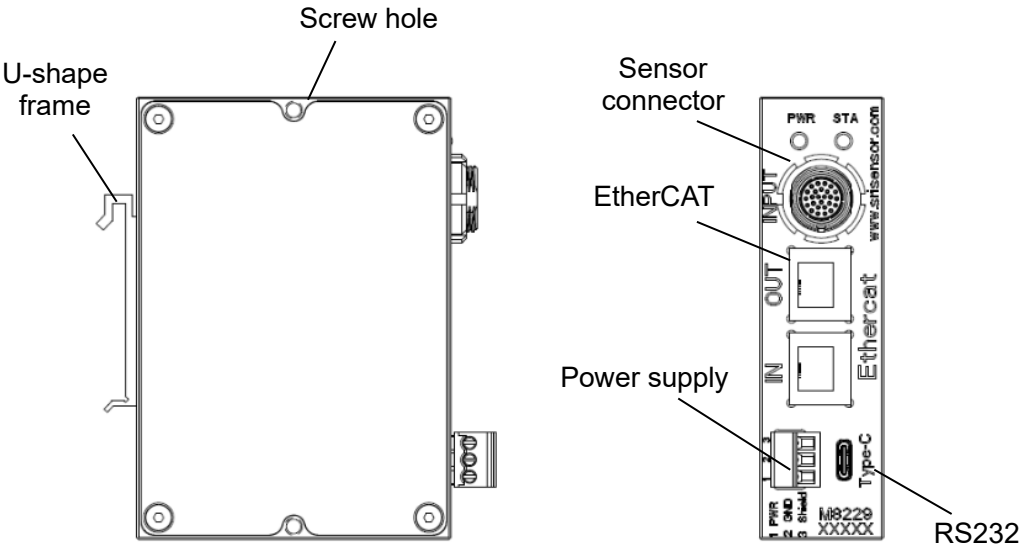
Click "Connect" button, software will connect to M8229 automatically. When connect successfully, the button will switch to "Stop".



Step 2: Select Eng in the output Unit box; check CH1~CH6 boxes to represent FX, FY, FZ, MX, MY, MZ; then click "RealTime" button to start obtaining real-time force/torque curves.

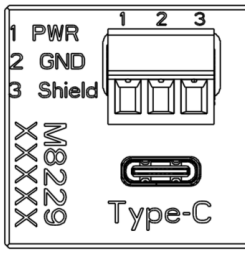


3. Frontal Panel



3.1 Power supply & CAN & Trigger

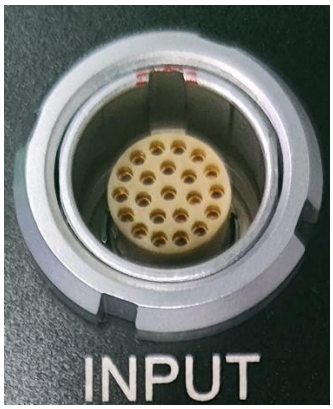
The cable color codes are defined as follows:



Pin #	Definition	Note
1	PWR	+Power, DC12-36V
2	GND	Ground
3	Shield	To reduce noise, it is recommended to connect the shield to the true ground in your test lab.

3.2 Sensor Connector

22 pin connector for M8229B1



Pin #	Definition	Note
1	CH1+	Channel 1
2	CH1-	
3	CH2+	Channel 2
4	CH2-	
5	CH3+	Channel 3
6	CH3-	
7	CH4+	Channel 4
8	CH4-	
9	CH5+	Channel 5
10	CH5-	
11	CH6+	Channel 6
12	CH6-	
13	CH7+	Channel 7
14	CH7-	
15	CH8+	Channel 8
16	CH8-	
17	CH9+	Channel 9
18	CH9-	
19	+E	Positive excitation
20	-E	Negative excitation（if support)
21~22	N/A	For future use

Note: To prevent signal interference, it is recommended to short unused sensor signal pins to " -E ".

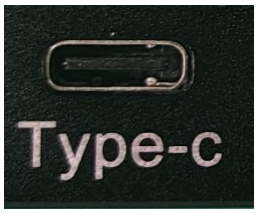
19 pin connector for M8229S1

Pin #	Definition	Note
1	CH1+	Channel 1
2	CH1-	
3	CH2+	Channel 2
4	CH2-	
5	CH3+	Channel 3
6	CH3-	
7	CH4+	Channel 4
8	CH4-	
9	CH5+	Channel 5
10	CH5-	
11	CH6+	Channel 6
12	CH6-	
13~16	N/A	
17	-E	Negative excitation（if support)
18	+E	Positive excitation
19	GND	

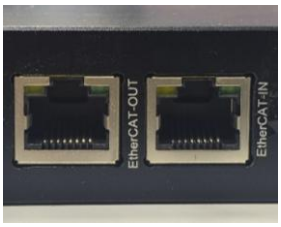
3.3 EtherCAT& RS232 connector

(1) USB Type-C connector

M8229 supports RS232 communication. There is a RS232 to USB converter in M8229, so customer can connect M8229 to PC by the type-c connector and communicate via USB.



(2) EtherCAT RJ45 connector



3.4 Indicated lights

There are two indicated lights: PWR (Power) and STA (Status). The conditions of these lights are defined as follows:

PWR	STA	Definition	Instruction
ON		Power is on	
ON	Flickering	System is working properly	
ON	ON	Excitation is abnormal	Check the loadcell cable
OFF	Flickering	System works ok. PWR light may get damaged	Either ignore or repair PWR light
OFF	ON	Excitation is abnormal and PWR light may get damaged	Check the loadcell cable or contact us

4. iDAS R&D Software

iDAS RD is a debugging software that supports the commands of M8229, which can be used to send a series of commands to M8229 to achieve a specific application.

- PC Requirement：WIN 7 and above
- Installation Procedure：Uncompressed iDAS RD
- Support RS232, Ethernet and EtherCAT communication

Please download the software iDAS R&D and it's User Manual at SRI website https://www.srisensor.com/software/

5. Commands

Definition:

Master: The equipment that send commands to M8229, such as PC or the user's control system. M8229 is called as Slave Equipment.
ASCII Code: America Standard Code for Information Interchange, refer to ISO 646.
M8229 commands are comprised of ASCII codes.
Command structures are shown as follows:
Send to Slave Equipment:
AT+CMD=Parameter\r\n
Response from Slave Equipment: (Except for the command GOD and GSD)
ACK+CMD=Parameter$ResponseCode\r\n

All data that sent to slave equipment must be ASCII code.
All data that received from slave equipment are ASCII code.
Before sent or after received, the data must be converted to or from ASCII

Descriptions:
AT: Frame Header when sending data. All data that are sent to Slave Equipment must be started with AT.
ACK: Frame Header when receiving data. All data that are received from Slave Equipment are started with ACK.
CMD: Command, such as SMPF.
Parameter: Parameters follow a command.
\r\n: Return symbol (Enter), which denotes the end of a command. ASCII code of "\r\n" is "0D 0A".
ResponseCode: Response code, such as OK or ERROR.
$: Interval symbol.

Note:

- Parameter '?' denotes that Master is asking for a response from Slave Equipment.
- M8229 will not respond until the command sent by Master is executed.
- When debugging with iDAS R&D software, the software performs ASCII conversion and put \r\n at the end of the command automatically.

Example:

Send: AT+SMPF=?\r\n
ASCII: 41 54 2B 53 4D 50 52 3D 3F 0D 0A
Response: ACK+SMPF=100$OK\r\n
ASCII: 41 43 4B 2B 53 4D 50 46 3D 31 30 30 24 4F 4B 0D 0A
Send: AT+GOD\r\n
ASCII: 41 54 2B 47 4F 44 0D 0A

Response：AA 55 00 1B 04 BB A1 8C B8 41 E0 19 30 42 DD 82 B0 40 A2 62 B8 C0 DB 68 75 40 9B EB 16 40 30

Command	Function	Note
Configuration of RS232		
UARTCFG	Read or set parameters of RS232	Immediate active
System parameters		
SMPF	Read or set sampling rate	
DCPM	Read or set decoupling matrix coefficient	
DCPCU	Read or set matrix calculation unit	(mV or mV/V)
SFWV	Read firmware version	
Get real-time data from M8229 via RS232		
DCKMD	Read or set data validation method	
GSD	Get data from M8229 continuously	
GOD	Get one package data from M8229	
ADJZF	Adjust zero offset of sensor	

5.1 UARTCFG / Communication Parameters for RS232

Description: To read or set parameters for RS232

Command Syntax:AT+UARTCFG=Rate,DataBit,StopBit,ParityBit

Command	Possible Response(s)
AT+UARTCFG=? **\r\n**	Rate,DataBit,StopBit,ParityBit
AT+UARTCFG=Rate, DataBit, StopBit, ParityBit**\r\n**	OK/ERROR
Note: Immediate effect.	

Parameters		
Parameter	**Variable Type (Valid Range)**	**Description**
Rate	Unsigned long int ($0 \sim 2^{32}-1$)	Baud Rate of RS232 in bps. Baud Rate of RS232 in M8229 can be 9600, 14400, 19200, 38400, 56000, 57600,115200, 230400, 256000, 460800, 921600bps. Default is 115200
DataBit	Int	Number of data bits in RS232 communication. The choices are: 5,6,7 and 8. Default is 8
StopBit	float	Number of stop bits in RS232 communication. The choices are: 0.5,1.0.1.5 and 2.0. Default is 1.0
ParityBit	char	Parity in RS232 communication. Choices are N,O and E, which denote none, odd and even respectively. Default is N

Example:

Send: AT+UARTCFG=?\r\n

Response: ACK+UARTCFG=115200,8,1.00,N$OK\r\n

Send: AT+UARTCFG=19200,8,1.00,N\r\n

Response: Messy codes

The baud rate of the master equipment should be changed to the current set value of 19200 in order to communicate correctly.

5.2 SFWV / Firmware version

Description: To read firmware version.
Command Syntax:AT+SFWV=?

Command	Possible Response(s)
AT+SFWV=?\r\n	version
Note:	

Parameters		
Parameter	**Variable Type (Valid Range)**	**Description**
version	String	Version #

Example:

Send: AT+SFWV=?\r\n

Response: ACK+SFWV=V11.00$OK\r\n

5.3 DCPM / Read or set decoupled matrix

Description: To read or set decoupled matrix
Command Syntax:AT+DCPM=Matrix

Command	Possible Response(s)
AT+**DCPM**=?\r\n	Matrix data
AT+**DCPM**=Matrix\r\n	OK/ERROR
Note:	

Parameters		
Parameter	**Variable Type (Valid Range)**	**Description**
Matrix	String	The format is as follows.

Example:

Send: AT+DCPM=?\r\n

Response: ACK+DCPM=(0.000041,-0.020164,-0.000348,0.020287,-0.000145,-0.000047);(-0.000160,-0.011703,-0.000089,-0.011668,-0.000217,0.023526);(-0.031415,-0.000185,-0.032273,0.000010,-0.031708,-0.000481);(-0.000888,-0.000014,0.000951,-0.000006,0.000029,0.000009);(-0.000521,0.000011,-

0.000531,-0.000009,0.001061,0.000015);(0.000002,0.000754,-0.000008,0.000753,-0.000007,0.000768)$OK\r\n
Refer to Section **7.0 Loadcell Decoupled Calculation** to obtain the decoupling matrix coefficients and calculation units of sensors

5.4 DCPCU / Calculation unit for decoupled data

Description: To set or read calculation unit.
Command Syntax:AT+DCPCU=Unit

Command	Possible Response(s)
AT+**DCPCU**=?\r\n	Uint
AT+**DCPCU**=Unit\r\n	OK/ERROR
Note:	

Parameters		
Parameter	**Variable Type (Valid Range)**	**Description**
Unit	String	MV and MVPV(mV/V)

Example:

Send: AT+DCPCU=?\r\n

Response: ACK+DCPCU=MV$OK\r\n

Send: AT+DCPCU=MVPV\r\n

Response: ACK+DCPCU=MVPV$OK\r\n

5.5 SMPF / Read or set sampling rate

Description: To read or set sampling rate.
Command Syntax: AT+**SMPF**=SampleFreq

Command	Possible response(s)
AT+**SMPF**=?	SampleFreq
AT+**SMPF**=SampleFreq	OK/ERROR
Note:	

Parameters		
Parameter	**Variable Type (Valid Range)**	**Description**
SampleFreq	Unsigned short int (1 ~ 2000)	Sampling Freq in Hz. For example, 200.

Example:

Send: AT+SMPF=?\r\n

Response: ACK+SMPF=300$OK\r\n

Send: AT+SMPF=200\r\n

Response: ACK+SMPF=200$OK\r\n

5.6 DCKMD / Set data-check method

Description: To set data-check method.
Command Syntax: AT+**DCKMD**=Mod

Command	Possible response(s)
AT+**DCKMD**=Mod	OK/ERROR
Note: iDAS R&D debugging software only supports SUM check.	
Parameters	

Parameter	Variable Type (Valid Range)	Description
Mod	String	Data check methods include SUM and CRC32; The default method SUM is used for data accumulation and verification. See the C language source code of CRC32 in the attached CD.

Example:

Send: AT+DCKMD=?\r\n

Response: ACK+ DCKMD =SUM$OK\r\n

5.7 GOD / Get one package data from M8229

Description: To get one package data from M8229.
Command Syntax: AT+**GOD**

Command	Possible response(s)
AT+**GOD**	DataFormat
Note:	
Parameters	

Parameter	Variable Type (Valid Range)	Description
DataFormat		Data package, refer to the following for details.

5.8 GSD / Get data continuously

Description: To get data continuously.
Command Syntax: AT+**GSD**

Command	Possible response(s)
AT+**GSD**	DataFormat
Note: To stop receiving data, send “AT+GSD=STOP\r\n” to M8229.	
Parameters	

Parameter	Variable Type (Valid Range)	Description
DataFormat		Data package, refer to the following for details.

"DataFormat" is defined as follows:

Frame Header	PackageLength	PackageNo	Data	CRC32 / SUM
0xAA ,0x55	HB,LB	2Byte	(ChNum*N*DNpCH)Byte	4Byte / 1Byte

Note:

- 0xAA ,0x55: Frame header of data package.
  PackageLength: Unsigned short int,16-bits, highest byte first, The length of data of each channel, which equals to 2+ChNum*N*DNpCH+1(SUM check) or 2+ ChNum*N*DNpCH+4(CRC32 check)
  Where
  ChNum: Total number of uploading channels, Defualt value 6
  N: the output unit, Defualt value 4
  DNpCH: Number of sampling points to upload in one package, Defualt value 1
- PackageNo: Every package is labeled, which increases in sequence from 0 to 65535.
- Data: Uploading data with the lowest byte first.
- CRC32/SUM: CRC32 or Checksum. The default data validation method is Checksum. Use Command DCKMD to select the data validation method (Checksum or CRC32).
  CRC32 function (MyCRC_GetCRC32 (uint8_t *pData, uint16_t Length)) in C program is included in the CD-ROM.

Example:

Send: AT+DCKMD=SUM\r\n

Response: ACK+DCKMD=SUM$OK\r\n

Send: AT+GOD\r\n

Response: AA 55 00 1B C4 C7 01 6A F4 C0 EF 7D 33 C0 49 62 C9 C0 A2 5C C6 BD A6 19 8F BD AF DA 69 3E 6E

Where

0xAA ,0x55: Frame header

00 1B: PackageLength 2+6*4*1+1=27 bytes;

C4 C7: Package No 50375;

Channel 1 Engineering Unit: 01 6A F4 C0, single-precision float (C0F46A01) converted into -7.637940;

Channel 2 Engineering Unit: EF 7D 33 C0, single-precision float

（C0337DEF）converted into -2.804561；

Channel 3 Engineering Unit：49 62 C9 C0, single-precision float

（C0C96249）converted into -6.293248；

Channel 4 Engineering Unit：A2 5C C6 BD, single-precision float

（BDC65CA2）converted into -0.096856；

Channel 5 Engineering Unit：A6 19 8F BD, single-precision float

（BD8F19A6）converted into -0.069873；

Channel 6 Engineering Unit：AF DA 69 3E, single-precision float

（3E69DAAF）converted into 0.228373

SUM Check: 6E

5.9 ADJZF/ Adjust zero offset of sensor

Description: Adjust zero offset of sensor

Command Syntax: AT+ADJZF

Command	Possible response(s)
AT+**ADJZF**=?	0;0;0;0;0;0 or 1;1;1;1;1;1
AT+**ADJZF**=1;1;1;1;1;1	OK/ERROR
Note: Send ”1;1;1;1;1;1” to M8229 to adjust zero offset of sensor. M8229 takes more than 2 seconds to complete zero offset adjusting process. During this process, sensor must keep static and do not move. Send ”0;0;0;0;0;0” to make M8229 back to the status which is before zero offset adjusting.	

Example:

Send：AT+ADJZF=?\r\n

Response：ACK+ADJZF=0;0;0;0;0;0$OK\r\n

Send：AT+ADJZF=1;1;1;1;1;1\r\n

Response：ACK+ADJZF=1;1;1;1;1;1$OK\r\n

6. Get Realtime Data from M8229

By RS232:

Step 1: Use command SMPF to set sampling rate. If the sampling rate is 100Hz:

AT+SMPF=100\r\n

Step 2: Use command GOD to get one package data or command GSD to get data continuously from M8229. Refer to Sections 5.7 and 5.8

Note:

- The parameters set by Command SMPF are saved in M8229, and they are still available after power off.
- If iDAS R&D software is used, M8229 is required to restart (Power off and Power on) before debugging your own codes.
- If the real time data of CH1~CH6 is incorrect, please check the decoupled matrix and the calculation unit, and refer to Section 4.0, 5.3, 5.4 and 7.0 of this Manual

By EtherCAT:

The dictionary file(*.xml) is supplied, can be connected into EtherCAT controller easily.

The EtherCAT dictionary is shown below.

Object	Name	Data Type	W/R	Discription
0x1000	Device Type	UINT32	RO	
0x1008	Manufacturer Device Name	STRING	RO	
0x1009	Hardware Version	STRING	RO	
0x100A	Software Version	STRING	RO	
0x1018	Identity Object	RECORD	RO	
0x1018.01	Vendor ID	UINT32	RO	
0x1018.02	Product Code	UINT32	RO	
0x1018.03	Revision Number	UINT32	RO	
0x1018.04	Serial Number	UINT32	RO	
0x1601	RPDO	UINT32	RO	
0x1A03	TPDO	UINT32	RO	
0x1A02	TPDO	UINT32	RO	
0x1C12	SM2 PDO	REC	RW	
0x1C13	SM3 PDO	REC	RW	
0x6030.01	DataNo	UINT16	RO	unsigned int 16bit 0~65535 increment each sample.
0x6030.02	Fx	REAL	RO	float 32bit eng. unit: N
0x6030.03	Fy	REAL	RO	float 32bit eng. unit: N
0x6030.04	Fz	REAL	RO	float 32bit eng. unit: N
0x6030.05	Mx	REAL	RO	float 32bit eng. unit: Nm
0x6030.06	My	REAL	RO	float 32bit eng. unit: Nm
0x6030.07	Mz	REAL	RO	float 32bit eng. unit: Nm
0x6020.01	DataNo	UINT16	RO	unsigned int 16bit 0~65535 increment each sample.
0x6020.02	Fx	INT32	RO	Fx = INT32/10000 eng. unit: N
0x6020.03	Fy	INT32	RO	Fy = INT32/10000 eng. unit: N
0x6020.04	Fz	INT32	RO	Fz = INT32/10000 eng. unit: N
0x6020.05	Mx	INT32	RO	Mx = INT32/10000 eng. unit: Nm
0x6020.06	My	INT32	RO	My = INT32/10000 eng. unit: Nm
0x6020.07	Mz	INT32	RO	Mz = INT32/10000 eng. unit: Nm
0x7010.01	Para1	UINT16	RW	NA, reserved for future use
0x7010.02	Para2	INT16	RW	NA, reserved for future use
0x7010.03	Para3	INT16	RW	NA, reserved for future use

7. Decoupled Calculation

If the M8229 is purchased together with SRI sensor, the decoupled matrix and calculation unit of SRI sensor have been configured in the M8229. The decoupled matrix and calculation unit can be updated by Command DCPM and DCPCU when necessary.

Decoupled matrix and calculation unit can be found in the calibration report. Two different reports formats will be provided according to the sensor's structure.

7.1 Matrix decoupled loadcell

The decoupled matrix and calculation unit are provided in the calibration report, as shown below:

[DECOUPLED] =

-0.03220	0.49984	0.00136	-1.01398	-0.01208	0.50908
0.00046	0.84855	0.01531	0.02114	-0.03126	-0.86432
1.19167	0.00028	1.20748	0.00224	1.19808	0.00320
-0.06386	-0.00097	0.13028	-0.00009	-0.06523	0.00012
-0.11090	0.00016	-0.00049	0.00075	0.11138	-0.00019
-0.00046	0.08401	-0.00067	0.08304	-0.00089	0.08433

The six axis loads can be decoupled as follows:

Step 1: Obtain the raw data of Channels 1 through 6 into mV
[DAT] = {rawchn1, rawchn2, rawchn3, rawchn4, rawchn5, rawchn6}
where rawchn1, rawchn2, rawchn3, rawchn4, rawchn5 and raw chn6 are in mV

Step 2: To calculate decoupled loads
$[RESULT]^T = [DECOUPLED]*[DAT]^T$
where [RESULT] = {FX,FY,FZ,MX,MY,MZ}. Force Unit: N. Moment Unit: Nm
[DECOUPLED] is the above decoupled matrix

The Commands to input the matrix coefficients and to set the calculation unit are as follows:

AT+DCPM=(-0.03220,0.49984,0.00136,-1.01398,-0.01208,0.50908);(0.00046,0.84855,0.01531,0.02114,-0.03126,-0.86432);(1.19167,0.00028,1.20748,0.00224,1.198078,0.00320);(-0.06386,-0.00097,0.13028,-0.00009,-0.06523,0.00012);(-0.11090,0.00016,-0.00049,0.00075,0.11138,-0.00019);(-0.00046,0.08401,-0.00067,0.083040,-0.00089,0.08433)
AT+DCPCU=MV

6.2 Structurally decoupled loadcell

The sensitivity provided in the calibration report needs to be converted into a matrix as shown below:

Voltage Calibration

Bridge	Capacity	Zero Offset	Nonlinearity	Hysteresis	Output @ Capacity	Sensitivity	Change
	N/Nm	mV/V	%FS	%FS	mV/V	mV/V/EU	%
FX	-5400	0.0131	-0.08	-0.33	-3.0269	5.6054E-04	0.00
FY	5400	0.0007	0.08	0.27	3.0500	5.6481E-04	0.00
FZ	-10800	0.0001	-0.09	-0.18	-0.7369	6.8230E-05	0.00
MX	-540	-0.0027	-0.09	-0.10	-1.8703	3.4636E-03	0.00
MY	-540	-0.0090	-0.09	-0.09	-1.9014	3.5210E-03	0.00
MZ	432	-0.0099	0.05	0.08	1.9603	4.5378E-03	0.00

Sensitivity unit is mV/V/Eu,. The diagonal elements of the matrix are the inverse of the sensitivities (1/Sensitivity). The calculation unit is mV/V.

1783.9940	0	0	0	0	0
0	1770.5069	0	0	0	0
0	0	14656.3095	0	0	0
0	0	0	288.7169	0	0
0	0	0	0	284.0102	0
0	0	0	0	0	220.3711

The Commands to input the matrix coefficients and to set the calculation unit are as follows:
AT+DCPM=(1783.9940,0,0,0,0,0);(0,1770.5069,0,0,0,0);(0,0,14656.3095,0,0,0)
;(0,0,0,288.7169,0,0); (0,0,0,0,284.0102,0); (0,0,0,0,0,220.3711)
AT+DCPCU=MVPV

Four possible conversion formula:

1) Sensitivity unit is mV/V/Eu. The conversion formula is 1/Sensitivity.
Calculation unit is mv/V: AT+DCPCU=MVPV.
2) Sensitivity unit is mV/Eu. The conversion formula is 1/Sensitivity.
Calculation unit is mv: AT+DCPCU=MV.
3) Sensitivity unit is V/V/Eu. The conversion formula is 1/Sensitivity/1000.
Calculation unit mv/V: AT+DCPCU=MVPV.
4) Sensitivity unit is V/Eu. The conversion formula is 1/Sensitivity/1000.
Calculation unit is mv: AT+DCPCU=MV.

7.3 Other Loadcells

Three axis and uni-axial loadcells from SRI can also be connected to M8229. Please follow the method described below to get the matrix.

Three Axis loadcell

Voltage Calibration

Bridge	Capacity	Zero Offset	Nonlinearity	Hysteresis	Output @ Capacity	Sensitivity	Change
	N/Nm	mV/V	%FS	%FS	mV/V	mV/V/EU	%
FX	-20000	0.0101	-0.13	-0.28	-2.8941	1.4471E-04	0.00
FY	20000	-0.0027	0.11	0.19	2.8894	1.4447E-04	0.00
FZ	-20000	0.0175	-0.07	-0.27	-0.5441	2.7207E-05	0.00

Sensitivity unit is mV/V/Eu. The diagonal elements of the matrix are the inverse of the sensitivities (1/Sensitivity).
The Commands to input the matrix coefficients and to set the calculation unit are as follows:

6910.3725	0	0	0	0	0
0	6921.8523	0	0	0	0
0	0	36755.2468	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

So, send the following commands to M8229 to set decoupled matrix and unit.

AT+DCPM=(6910.3725,0,0,0,0,0);(0,6921.8523,0,0,0,0);(0,0,36755.2468,0,0,0)
;(0,0,0,0,0,0);(0,0,0,0,0,0); (0,0,0,0,0,0)
AT+DCPCU=MVPV

Torque Sensor

Voltage Calibration

Bridge	Capacity	Zero Offset	Nonlinearity	Hysteresis	Output @ Capacity	Sensitivity	Change
	Nm	V	%FS	%FS	V	V/EU	%
MZ	100	-0.0049	0.04	0.27	2.0445	2.0445E-02	0.00

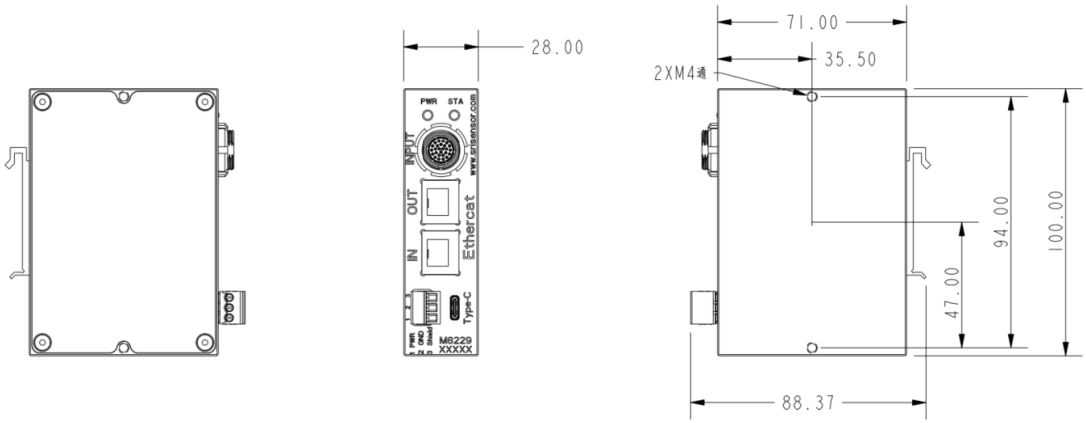
Sensitivity unit is V/Eu.
The first row and the first column equals to 1/sensitivity/1000.
Calculation unit is mV.

0.048913	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

So, send the following commands to M8229 to set decoupled matrix and unit.

AT+DCPM=(0.048913,0,0,0,0,0);(0,0,0,0,0,0);(0,0,0,0,0,0);(0,0,0,0,0,0);(0,0,0,0,0,0);(0,0,0,0,0,0)
AT+DCPCU=MV

8. Dimension


28.00
PWR
STA
INPUT
OUT
IN
Ethercat
Type-C
M8229
XXXXX
71.00
35.50
2XM4通
94.00
100.00
47.00
88.37