

1. Introduction / Purpose

Specification and documentation of the interface protocol of the ARMANO calibration technology device series DPC (digital pressure controllers).

2. Connection Parameters

Ethernet

Port TCP 2100

RS-232

9600 baud symbol rate

8 data bits

no parity

1 stop bit

3. Transmission Format

The commands to the controller and the feedback are transferred as ASCII text string in plain text. The character string <CR><LF>, which corresponds to the character codes &h0D followed by &h0A, serves as the terminating identifier. For numerical values, the dot serves as decimal separator.

4. Commands

Command	Example (send)	Example (receive)	Description
?	?<CR><LF>	1.45362;2.00000;0<CR><LF>	General query. The response string is formatted according to the active output format. Example: the output format N0 sends "ACTUAL_VALUE;DESIRED_VALUE;STABLE_STATUS" ⇒ chapter 5 "Output Format of the Device Status"
N{VALUE}	N0<CR><LF> to N99<CR><LF>		Change the output format (0...99). Unspecified formats N behave like N0. ⇒ chapter 5 "Output Format of the Device Status"
N?	N?<CR><LF>	10<CR><LF>	Query of the active output format.
P={VALUE}	P=5.014<CR><LF>		Set the desired pressure value (set pressure value) in the active unit.
R0	R0<CR><LF>		Activate Autorange. The device itself selects the optimal sensor of the available measuring ranges. The device must be in VENT mode!
R1	R1<CR><LF>		The device uses the sensor of the first measuring range. The device must be in VENT mode!
R2	R2<CR><LF>		The device uses the sensor of the second measuring range. The device must be in VENT mode!
R3	R3<CR><LF>		The device uses the sensor of the third measuring range. The device must be in VENT mode!
T0	T0<CR><LF>		Deactivate tare. The device must be in VENT mode! Usually not required, as the device exits the taring mode on its own.
T1	T1<CR><LF>		Activate tare. The device tares (zeroes) the sensors and exits the taring mode on its own. The device must be in VENT mode!
V0	V0<CR><LF>		Open vent valve.
V1	V1<CR><LF>		Close vent valve.
C0	C0<CR><LF>		Switch off the pressure control.
C1	C1<CR><LF>		Switch on the pressure control. The device controls the pressure at the desired value set with the P= command.
#T16	#T16<CR><LF>	1.45362<CR><LF>	Send a current pressure value. Deprecated; only to provide backward compatibility. See command ? for newer implementations.
U{VALUE}	U5<CR><LF>		Change the pressure unit to the entered unit. ⇒ chapter 6 "Units"
U?	U?<CR><LF>	1<CR><LF>	Query of the active pressure unit.
DB?	DB?<CR><LF>	0.005<CR><LF>	Query of the dead band of the active range. ⇒ STABLE_STATUS of the output format.
DB1?	DB1?<CR><LF>	0.1<CR><LF>	Query of the dead band of the first range. ⇒ STABLE_STATUS of the output format.
DB2?	DB2?<CR><LF>	0.0002<CR><LF>	Query of the dead band of the second range. ⇒ STABLE_STATUS of the output format.
DB3?	DB3?<CR><LF>	0.005<CR><LF>	Query of the dead band of the third range. ⇒ STABLE_STATUS of the output format.
LOCK1	LOCK1<CR><LF>		Lock touchscreen.
LOCK0	LOCK0<CR><LF>		Unlock touchscreen.

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Interface protocol

Command	Example (send)	Example (receive)	Description
LIMU={VALUE}	LIMU=22.2<CR><LF>		Set the upper limit that the pressure controller approaches with the P= command.
LIMU?	LIMU?<CR><LF>	22.2<CR><LF>	Query upper limit that can be approached in the controller.
ABS1	ABS1<CR><LF>		Change to absolute mode. Option BaroRef must be installed!
ABS0	ABS0<CR><LF>		Change to gauge mode. Option BaroRef must be installed!
ABS?	ABS?<CR><LF>	-1<CR><LF>	Query of the pressure mode (absolute, gauge). Returns -1 if no barometer is installed.
DIG={VALUE}	DIG=1<CR><LF>		Set the number of decimal places (0...5).
DIG?	DIG?<CR><LF>	4<CR><LF>	Query of the displayed number of decimal places (0...5).
ID?	ID?<CR><LF>	0150264423 <CR><LF> or SN;0150264423;G22M;FALSE; FALSE;FALSE;TRUE<CR><LF>	Query of the serial number and the configured device options. The ranges return an ID for the sensor used in that range, e.g. G22M, CG100K. Return value: "serial number" (for output format N0...N9 and N12...N99) or "SN;Serial number;Range1;Range2;Range3;Baro-Ref;Options" (for output format N10 and N11)
LANG={VALUE}	LANG=1<CR><LF>		Change the menu language: 1 = German, 2 = English, 3 = Russian, 4 = Italian. Additional languages are available upon request.
LANG?	LANG?<CR><LF>	1<CR><LF>	Query of the active language.
CONTROL0	CONTROL0<CR><LF>		Set the controller to vent.
CONTROL1	CONTROL1<CR><LF>		Set the controller to control.
CONTROL2	CONTROL2<CR><LF>		Set the controller to measure.
CONTROL?	CONTROL?<CR><LF>	CONTROL1<CR><LF>	Query of the active mode, e.g. returns CONTROL2 if control is active.
CONTROLMODE=FAST	CONTROLMODE=FAST<CR><LF>		Set the control mode to FAST.
CONTROLMODE=NORMAL	CONTROLMODE=NORMAL<CR><LF>		Set the control mode to NORMAL.
CONTROLMODE=PRECISE	CONTROLMODE=PRECISE<CR><LF>		Set the control mode to PRECISE.
CONTROLMODE=CUSTOM	CONTROLMODE=CUSTOM<CR><LF>		Set the control mode to CUSTOM.
CONTROLMODE=?	CONTROLMODE=?<CR><LF>	CONTROLMODE=NORMAL<CR><LF>	Query of the active control mode. e.g. if the controller is in precise mode, the returned string is "CONTROLMODE=PRECISE".
DEVICE?	DEVICE=?<CR><LF>	C4800-A+<CR><LF>	Query of the device model. e.g. returns "C4800-A+", "C4800-P"
DEVICECONFIG?	DEVICECONFIG=?<CR><LF>		List the installed device configuration. Return value: "Option1;Option2;Option3;Option4", e.g. "01;FALSE;FALSE;FALSE"
STEP={VALUE}	STEP=2.0<CR><LF>		Set the step value in the active pressure unit.
STEP?	STEP?<CR><LF>	1.0<CR><LF>	Query of the current step value in the active pressure unit.
STEPUP	STEPUP<CR><LF>		Increase the pressure by one step in control mode.
STEPDN	STEPDN<CR><LF>		Decrease the pressure by one step in control mode.

5. Output Format of the Device Status

Depending on the set status format N0 to N99, different information is returned in case of a query with ?.

Command	Example	Description
N0	10.0001871;10.0000000;1<CR><LF>	ACTUAL_VALUE;DESIRED_VALUE;STABLE_STATUS<CR><LF>
N10	1;0;0;0;0.0006000;0;1;0;0;1;4;-1;0.1050000;0<CR><LF>	ACTUAL_VALUE;DESIRED_VALUE;STABLE_STATUS;STABLE_TIME;DEAD_BAND;CONTROL_ON/OFF;VENT_OPEN/CLOSED;ABS_REL;TARE_ON/OFF;ACTIVE_SENSORRANGE;ACTIVE_PRESSURE-UNIT;BAROREF;OVERPESSURE_SHUTOFF;DRIVER_STATUS<CR><LF>
N11	1;0;0;0;0.0006000;0;1;0;0;1;4;-1;0.1050000;0;0.0213523<CR><LF>	ACTUAL_VALUE;DESIRED_VALUE;STABLE_STATUS;STABLE_TIME;DEAD_BAND;CONTROL_ON/OFF;VENT_OPEN/CLOSED;ABS_REL;TARE_ON/OFF;ACTIVE_SENSORRANGE;ACTIVE_PRESSURE-UNIT;BAROREF;OVERPESSURE_SHUTOFF;DRIVER_STATUS;PRESSURE_RATE<CR><LF>
others		see N0.

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The following applies to the individual fields:

ACTUAL_VALUE	Actual pressure value in the active unit.
DESIRED_VALUE	Set pressure value in the active unit.
STABLE_STATUS	If the control is stable, 1 is returned, otherwise 0. Stable criteria ⇒ DEAD_BAND value.
STABLE_TIME	Elapsed time in milliseconds since the controller fulfilled the stable criteria. After 60,000 ms this value starts again at zero.
DEAD_BAND	Band (+/- value in bar) around the set pressure value. The controller is stable if the actual pressure value is within this band.
CONTROL_ON/OFF	1 if the control algorithm is active, otherwise 0.
VENT_OPEN/CLOSED	1 if the pressure system is vented, otherwise 0.
ABSOLUTE_GAUGE	1 for absolute pressure mode, 0 for gauge pressure mode.
TARE_ON/OFF	1 if the device is currently taring the sensors, otherwise 0.
ACTIVE_SENSORRANGE	0 for automatic range selection, 1 for the highest pressure range, 2 for the medium range, 3 for the lowest pressure range.
ACTIVE_PRESSUREUNIT	ID number of the active pressure unit.
BAROREF	Pressure reading of the (optional) barometric reference in the active unit. If no reference is installed, the value is returned as -1.
OVERPRESSURE_SHUTOFF	Pressure value in bar at which the vent valve is automatically opened for protection.
DRIVER_STATUS	Byte value indicating the status of the internal 24 V driver.
PRESSURE_RATE	Active pressure change rate.

6. Units

A total of 24 fixed units and one user-defined unit are available (see table).
These cover both European and Anglo-American requirements.

ID	Unit symbol	Unit	From unit into kPa	From kPa into unit	From unit into bar	From bar into unit
1	Pa	Pascal	0.001	1000	0.00001	100000
2	kPa	Kilopascal	1	1	0.01	100
3	MPa	Megapascal	1000	0.001	10	0.1
4	mbar	Millibar	0.1	10	0.001	1000
5	bar	Bar	100	0.01	1	1
6	kg/cm ²	Kilogram per square centimetre	98.0665	0.010197	0.980665	1.019716
7	kg/m ²	Kilogram per square metre	0.009807	101.971621	0.000098	10197.16213
8	mmHg	Millimetre of mercury	0.133322	7.500617	0.001333	750.061702
9	cmHg	Centimetre of mercury	1.333224	0.750062	0.013332	75.00617
10	mHg	Metre of mercury	133.322365	0.007501	1.333224	0.750062
11	mmH ₂ O	Millimetre of water	0.009806	101.9744	0.000098	10197.439998
12	cmH ₂ O	Centimetre of water	0.098064	10.19744	0.000981	1019.744
13	mH ₂ O	Metre of water	9.806383	0.101974	0.098064	10.19744
14	torr	Torr	0.133322	7.500617	0.001333	750.0617
15	atm	Standard atmosphere	101.324998	0.009869	1.01325	0.986923
16	psi	Pound-force per square inch	6.894757	0.145038	0.068948	14.503774
17	lb/ft ²	Pound-force per square foot	0.04788	20.885436	0.000479	2088.543646
18	inHg (0 °C)	Inch of mercury	3.38639	0.2953	0.033864	29.529969
19	inH ₂ O (4 °C)	Inch of water 4 °C	0.249082	4.014742	0.002491	401.474228
20	ftH ₂ O (4 °C)	Foot of water 4 °C	2.98898	0.334562	0.02989	33.45623
21	SPEC'L	User-defined unit	1	1	1	1
22	inH ₂ O (20 °C)	Inch of water 20 °C	0.248641	4.021863	0.002486	402.186281
23	ftH ₂ O(20 °C)	Foot of water 20 °C	2.983692	0.335155	0.029837	33.515520
24	hPa	Hectopascal	0.1	10	0.001	1000
25	oz/in ²	Ounces per square inch	0.430922	2.320604	0.004309	232.060380

Upon customer request

- further units can be defined,
- the number of decimal places displayed can be adjusted.