OCTOGON

MANUAL

EMLC

LOAD CELL DIGITIZER

Installation and user manual



Document	Version	Date	Applies to
Installation and user manual	V00x	10/2026	EMLC, stainless steel and PA66 version

This manual describes installation, connection, commissioning, calibration and programming of the EMLC load cell digitizer, its status LEDs, the data exchanged via the communication interfaces and the serial protocols.

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1 About this manual

The EMLC transforms an analogue load cell (mV/V output) into a digital one. It is managed and configured via PC with the Instrument Manager software (micro USB connection), or remotely via the serial protocol or the fieldbus of the respective version.

Chapters 2 to 6 cover installation and connection, chapters 7 to 10 the operation of the instrument through the communication interface: each function is described first, followed by the registers and commands to read or change it (chapter 7). Chapters 11 and 12 describe the setup of each fieldbus and of the serial protocols, chapter 14 the directives and standards.

Where the versions differ, the section title or the table names the version. Alarm names and a few setting names are set in a fixed-width typeface, for example **ERCEL**.

1.1 Symbols

Notice	Meaning
Caution	Risk of electric shock, or: this operation must be performed by skilled personnel.
Important	Pay particular attention to the following instructions.
Note	Further information.

1.2 Versions covered

	Stainless steel version	PA66 version
Box	AISI 304 stainless steel	Nylon PA66, glass fibre reinforced, black
Fixing	installation supports (section 4.3)	installation supports (section 4.3)

Type marking on the device (both versions): LCB.

Both housings are available with one of the following communication interfaces. The BUS IN and BUS OUT connectors depend on the interface (section 5.4).

Version	Interface	BUS IN / BUS OUT
RS485 + analogue	RS485 serial port (ASCII, Modbus RTU, continuous protocols) and analogue output (current or voltage)	male + female M12, A-coded, 5-pin
IO-Link	IO-Link device	2 × male M12, A-coded, 4-pin
CANopen	CANopen slave	male + female M12, A-coded, 5-pin
CC-Link IE Field Basic	slave	2 × female M12, D-coded, 4-pin
Modbus/TCP	slave	2 × female M12, D-coded, 4-pin
EtherNet/IP	adapter	2 × female M12, D-coded, 4-pin
PROFINET IO	device	2 × female M12, D-coded, 4-pin
EtherCAT	slave	2 × female M12, D-coded, 4-pin
POWERLINK	slave	2 × female M12, D-coded, 4-pin
SERCOS III	slave	2 × female M12, D-coded, 4-pin

A version with RS485 only (without analogue output) is in preparation. Where this manual refers to the RS485 serial interface, it applies to the RS485 + analogue version.

2 Safety and installation

2.1 Recommendations for proper use

- Keep away from heat sources and direct sunlight.
- Do not dip in water.
- Do not spill liquid on the instrument (refer to the materials table, section 2.2).
- Do not use solvents to clean the instrument (refer to the materials table, section 2.2).
- Do not install in areas subject to explosion hazard.

2.2 Materials

Material of the instrument components exposed to external agents:

Component	Stainless steel version	PA66 version
Cover	stainless steel AISI 304	nylon PA66, glass fibre reinforced, black
Base	stainless steel AISI 304	nylon PA66, glass fibre reinforced, black
Screws	stainless steel A4	nylon, black
Seals	elastomer, food grade silicone	elastomer, food grade silicone
M12 connectors	stainless steel AISI 304; elastomer silicone	metal, nickel-plated zinc alloy; elastomer silicone
M12 connector counterparts	elastomer EPDM; plastic nylon	elastomer EPDM; plastic nylon
Light guides	plastic PC	plastic PC
Clamping nut	stainless steel AISI 304	stainless steel AISI 304
USB cap	stainless steel AISI 304	nylon PA66, glass fibre reinforced, black
USB seal	elastomer EPDM	elastomer EPDM
PG7 cable gland	plastic PA6.6	plastic PA6.6
PG7 O-ring	elastomer NBR	elastomer NBR
Label	plastic polyester	plastic polyester
Installation supports	stainless steel AISI 304	stainless steel AISI 304

2.3 Correct installation of weighing instruments

- The terminals indicated on the instrument's wiring diagram to be connected to earth must have the same potential as the weighed structure (same earthing pit or earthing system). If you are unable to ensure this condition, connect with an earthing wire the terminals of the instrument (including the terminal – SUPPLY) to the weighed structure.
- The cell cable must be individually led to its panel input and not share a conduit with other cables; connect it directly to the instrument terminal strip without breaking its route with support terminal strips.
- Use RC filters on the instrument-driven solenoid valve and remote control switch coils.

– Avoid inverters in the instrument panel; if inevitable, use special filters for the inverters and separate them with sheet metal partitions.
– The panel installer must provide electric protections for the instruments (fuses, door lock switch etc.).
– It is advisable to leave the equipment always switched on to prevent the formation of condensation.

Maximum cable lengths

Connection	Maximum length
RS485	1000 m with AWG24, shielded and twisted cables
Analogue current output	up to 500 m with 0.5 mm² cable
Analogue voltage output	up to 300 m with 0.5 mm² cable

2.4 Correct installation of the load cells

Sizing of load cells capacity

For safety reasons, in case of static weighing, it is advisable to use the load cells at a maximum of 70 ... 80 % of their nominal capacity (assuming that the load is uniformly distributed over the entire weighed structure); depending on the handling mode of the load to weigh, consider to further reduce the percentage of load with respect to the nominal capacity (e.g. forklift handling, bridge cranes). In case of weighing with dynamic loads, the installer has to estimate the thrust speed, the acceleration, the frequency etc.

Installing load cells

The load cells must be placed on rigid, stable in-line structures; it is important to use the mounting modules for load cells to compensate for misalignment of the support surfaces.

Connecting several cells in parallel

Connect several cells in parallel by using – if necessary – a watertight junction box with terminal box. The cell connection extension cables must be shielded, led individually into their piping or conduit and laid as far as possible from the power cables (in case of 4-wire connections, use cables with 4 × 1 mm² minimum cross-section).

Protection of the cell cable

Use water-proof sheaths and joints in order to protect the cables of the cells.

Mechanical restraints (pipes etc.)

When pipes are present, use hoses and flexible couplings with open mouthpieces with rubber protection; in case of hard pipes, place the pipe support or anchor bracket as far as possible from the weighed structure (at a distance at least 40 times the diameter of the pipe).

Welding

Avoid welding with the load cells already installed. If this cannot be avoided, place the welder ground clamp close to the required welding point to prevent sending current through the load cell body.

Windy conditions, knocks, vibrations

The use of weigh modules is strongly recommended for all load cells to compensate for misalignment of the support surfaces. The system designer must ensure that the plant is protected against lateral shifting and tipping relating to: shocks and vibration; windy conditions; seismic conditions in the installation setting; stability of the support structure.

Earthing the weighed structure

By means of a copper wire with suitable cross-section, connect the cell upper support plate with the lower support plate, then connect all the lower plates to a single earthing system. Electrostatic charges accumulated because of the product rubbing against the pipes and the weighed container walls are discharged to the ground without going through or damaging the load cells. Failure to implement a proper earthing system might not affect the operation of the weighing system; this, however, does not rule out the possibility that the cells and connected instrument may become damaged in the future. It is forbidden to ensure earthing system continuity by using metal parts contained in the weighed structure.

Important Failure to follow the installation recommendations will be considered a misuse of the equipment.

2.5 Load cell testing

Load cell resistance measurement (use a digital multimeter)

– Disconnect the load cells from the instrument and check that there is no moisture in the cell junction box caused by condensation or water infiltration. If so, drain the system or replace it if necessary.

– The value between the positive signal wire and the negative signal wire must be equal or similar to the one indicated in the load cell data sheet (output resistance).

– The value between the positive excitation wire and the negative excitation wire must be equal or similar to the one indicated in the load cell data sheet (input resistance).

– The insulation value between the shield and any other cell wire and between any other cell wire and the body of the load cell must be higher than 20 MΩ.

Load cell voltage measurement (use a digital multimeter)

– Take out the load cell to be tested from underneath the container, or alternatively, lift the container support.

– Make sure that the excitation of two wires of the load cell connected to the instrument is 3.3 V DC ±3 %.

– Measure the response signal between the positive and the negative signal wires by directly connecting them to the tester, and make sure that it is comprised between 0 and ±0.5 mV.

– Apply load to the cell and make sure that there is a signal increment.

If one of the above conditions is not met, please contact octogon.

3 Product description

3.1 Main specifications

– Weight transmitter with one load cell input (4-wire; 6-wire via jumpers, section 5.1), IP67 box in stainless steel or PA66.

– 6 status LEDs (L1 ... L6) of the communication interface.

– Micro USB-B connector for PC connection.

– Depending on the version: RS485 serial port (for connection to PC/PLC up to 32 instruments, max. 99 with line repeaters, by ASCII or Modbus RTU protocol, remote display, printer) with 16 bit analogue output (voltage or current), CANopen, PROFINET IO, EtherNet/IP, Modbus/TCP, SERCOS III, POWERLINK, EtherCAT, CC-Link IE Field Basic or IO-Link.

– Two programs: BASE (setpoint management) and LOAD (single product loading), section 8.1.

Note The instrument is managed and configured via PC with the Instrument Manager software, or remotely via serial protocol or fieldbus.

3.2 Parts identification

Part	Description
BUS IN / BUS OUT	M12 connectors specific for the communication interface; the corresponding flying connectors with solder terminals are supplied.
SERVICE	M12 connector dedicated to the instrument power supply and to the digital outputs and inputs connection; the corresponding flying connector with solder terminals is supplied.
L1 ... L6	status LEDs of the communication interface (chapter 6)
USB cap	–
Hole for USB input	–
Hole for load cell input	–
PG7 cable gland	–
Label	–
Installation supports	section 4.3

3.3 Technical data

Specification	Value
Power supply and consumption	12/24 V DC ±10 %; 5 W

Specification	Value
Number of load cells in parallel and supply	max. 4 (350 Ω), or 8 (700 Ω); 3.3 V DC / 40 mA
Linearity / analogue output linearity	< 0.01 % F.S.; < 0.01 % F.S.
Thermal drift / analogue output thermal drift	< 0.0005 % F.S./°C; < 0.003 % F.S./°C
A/D converter	24 bit (16 000 000 points)
Max. divisions	±999999; 6.6 nV/d
Measurement range	±26 mV
Max. sensitivity of usable load cells	±7 mV/V
Display range	±999999
Number of decimals / display increments	0 ... 4 / x1 x2 x5 x10 x20 x50 x100
Digital filter / readings per second	3 filter types / 5 ... 500 readings per second (section 9.2)
Relay outputs	3 – max. 115 V AC, 150 mA; 24 V DC, 200 mA
Digital inputs	2 – 5 ... 24 V DC PNP
Analogue output (RS485 + analogue version)	16 bit; 0 ... 20 mA, 4 ... 20 mA (max. 400 Ω); 0 ... 10 V, 0 ... 5 V (min. 2 kΩ)
Serial port (RS485 + analogue version)	RS485; 2400, 4800, 9600, 19200, 38400, 115200 baud
Micro USB port	type B – USB 2.0 (full speed)
Humidity (non condensing)	85 %
Protection rating	IP67
Storage temperature	–30 ... +80 °C
Working temperature	–20 ... +50 °C

3.4 Conditions for UL (USA and Canada)

UL conditions (mark cURus, USA and Canada), valid for both housings covered by this manual:

Condition	Value
Relay outputs	3 – max. 30 V AC, 60 V DC
Max. wall mounting height	2 m
Power supply	Equipment to be powered by PS2 power source.

4 Mounting and connection to the load cell

The instrument is either screwed directly onto the cable gland of the load cell (direct connection) or connected to the load cell via cable through the PG7 cable gland and fixed with the installation supports.

Caution Before carrying out the load cell wiring, make sure the instrument is not powered.

4.1 Direct connection

- Cut the load cell cable approximately 90 mm from the cable gland.
- Strip the cable for about 45 mm.
- Roll up the shielding braid until a wire is obtained.
- Electrically isolate the metal elements in the cable to avoid short circuits inside the instrument.
- Strip the wires end.
- While holding the cable in place, screw the cell nut up to the stop (max. ½ turn).
- Stainless steel version: screw the supplied nut onto the load cell cable gland. PA66 version: screw the supplied adapter onto the load cell cable gland.
- Wrap the Teflon tape around the thread of the adapter.
- Remove the instrument cover.
- Screw the instrument onto the load cell cable gland.
- Lock the instrument by tightening the nut with the supplied wrench.
- Wire the instrument terminal block and connect the cable shield to EX– (section 5.1).
- Put the instrument cover back on and tighten the four screws.

4.2 Connection via cable

- Remove the instrument cover.
- Screw the PG7 cable gland with O-ring into the cell hole in order to make a seal.
- Loosen the head of the cable gland.
- Insert the load cell cable into the instrument by passing through the cable gland.
- Strip the cable for about 45 mm.
- Roll up the shielding braid until a wire is obtained.
- Electrically isolate the metal elements in the cable to avoid short circuits inside the instrument.
- Strip the wires end.
- Wire the instrument terminal block and connect the cable shield to EX– (section 5.1).
- Put the instrument cover back on.
- Gently pull the cable outwards to recover the excess.
- Tighten the four screws of the cover and tighten the head of the cable gland.
- If necessary for fixing, use the installation supports (section 4.3).

4.3 Mechanical fixing

To fix the instrument use the installation supports. Drilling for fixing (both versions):

Drilling	Value
Number of holes	2
Hole diameter	Ø 6 mm
Centre distance	68 mm

5 Electrical connections

5.1 Load cell terminal block

Caution Before carrying out the load cell wiring, make sure the instrument is not powered.

Terminals from left to right:

Terminal	Signal
SIG+	+ load cell signal
SIG–	– load cell signal
EX–	– load cell excitation
EX+	+ load cell excitation

- It is possible to supply up to four 350 Ω load cells, or eight 700 Ω load cells.
- 4-wire load cell connection: connect SIG+, SIG–, EX– and EX+ of the load cells to the terminals of the same name; the cable shield goes to EX–.
- For 6-wire load cells make a jumper between EX– and REF– and between EX+ and REF+.

5.2 SERVICE connector

Male M12, 8-pin, A-coded. The flying connector with solder terminals is supplied.

Pin	All versions except IO-Link	IO-Link version
1	+SUPPLY (12/24 V DC)	24 V DC OUT (max. 100 mA)
2	–SUPPLY (GND) / INPUT COMMON	GND / INPUT COMMON
3	INPUT No. 1	INPUT No. 1
4	INPUT No. 2	INPUT No. 2
5	OUTPUT COMMON	OUTPUT COMMON
6	OUTPUT No. 1	OUTPUT No. 1
7	OUTPUT No. 2	OUTPUT No. 2
8	OUTPUT No. 3	OUTPUT No. 3

- Inputs: supply 5 ... 24 V DC. Outputs: max. 115 V AC, 150 mA.
- It is recommended to ground the power supply negative pole.
- IO-Link version: the power supply is provided only through the interface connector used (section 5.4.3); when the IO-Link cable is connected to the instrument, the 24 V DC voltage is also present on the 24 V DC OUT contact of the SERVICE connector and can be used to drive inputs and outputs. The maximum output current is 100 mA.

5.3 Analogue outputs (RS485 + analogue version)

Current output and voltage output are available only for the RS485 + analogue version and cannot be used simultaneously.

All the instrument's analogue outputs are of the ACTIVE and SINGLE ENDED type, therefore they can be connected only to PASSIVE receiver devices. The minimum load allowed for voltage outputs is 2 kΩ, the maximum load allowed for current outputs is 400 Ω.

5.4 Communication interface connectors (BUS IN – BUS OUT)

The BUS IN and BUS OUT connectors are specific for the different communication interfaces.

5.4.1 RS485 + analogue version

	Value
Baud rate (kb/s)	2400, 4800, 9600, 19200, 38400, 115200
Current output	0 ... 20 mA; 4 ... 20 mA (max. 400 Ω)
Voltage output	0 ... 10 V; 0 ... 5 V (min. 2 kΩ)

Pin	BUS IN – male M12, 5-pin, A-coded	BUS OUT – female M12, 5-pin, A-coded
1	RS485 +	RS485 –
2	RS485 –	RS485 +
3	–	CURRENT OUTPUT
4	–	VOLTAGE OUTPUT
5	GND	GND / ANALOGUE OUTPUT COMMON

RS485 network: if the RS485 network exceeds 100 metres in length or baud rates over 9600 are used, two terminating resistors are needed at the ends of the network. Two 120 Ω resistors must be connected between the "+" and "–" terminals of the line, on the terminal strip of the furthest instruments. Should there be different instruments or converters, refer to the specific manuals to determine whether it is necessary to connect the above-mentioned resistors.

Direct connection between RS485 and RS232 without converter: since a two-wire RS485 output may be used directly on an RS232 input of a PC or remote display, it is possible to connect the instrument to an RS232 port as follows:

Instrument	RS232
RS485 –	RXD
RS485 +	GND

This type of connection allows a single instrument to be used in a one-way mode.

5.4.2 CANopen version

Baud rate (kb/s): 10, 20, 50, 125, 250, 500, 800, 1000. Node ID: 1 ... 127.

Pin	BUS IN – male M12, 5-pin, A-coded	BUS OUT – female M12, 5-pin, A-coded
1	CAN SHLD	CAN SHLD
2	–	–
3	CAN GND	CAN GND
4	CAN H	CAN H
5	CAN L	CAN L

5.4.3 IO-Link version

Pin	BUS IN – male M12, 4-pin, A-coded	BUS OUT – male M12, 4-pin, A-coded
1	L+	L+
2	–	–
3	L–	L–
4	C/Q	C/Q

Note The IO-Link protocol uses point-to-point network connections between gateway and device; use only one communication interface connector (BUS IN or BUS OUT).

5.4.4 Ethernet versions

EtherCAT, EtherNet/IP, Modbus/TCP, POWERLINK, PROFINET IO, CC-Link IE Field Basic and SERCOS III. Port: 2 × 10Base-T or 100Base-TX (auto-detect).

Pin	BUS IN – female M12, 4-pin, D-coded	BUS OUT – female M12, 4-pin, D-coded
1	TD+	TD+
2	RD+	RD+
3	TD–	TD–
4	RD–	RD–

Meaning of the signals in accordance with the ANSI/TIA-568 standard.

6 Status LEDs

The six LEDs L1 ... L6 show the status of the communication interface. Their meaning depends on the version.

6.1 CANopen version

LED	Status	Description
L6 red	off	bus OK
	on	bus error

6.2 IO-Link version

LED	Status	Description
L3 red	blinking	bus error
L4 green	blinking	bus OK

6.3 EtherCAT version

LED	Status	Description
L1 green	off	BUS IN – Ethernet link not established
	on	BUS IN – Ethernet link established
	blinking	BUS IN – Ethernet activity detected
L3 red	blinking	general configuration error
	single blinking	local error
	double blinking	timeout error
L4 green	off	INIT status
	blinking	Pre-Operational status
	single blinking	Safe-Operational status
	on	Operational status
L5 green	off	BUS OUT – Ethernet link not established
	on	BUS OUT – Ethernet link established
	blinking	BUS OUT – Ethernet activity detected

6.4 EtherNet/IP version

LED	Status	Description
L1 green	off	BUS IN – Ethernet link not established
	on	BUS IN – Ethernet link established
L2 yellow	off	BUS IN – Ethernet activity not detected
	blinking	BUS IN – Ethernet activity detected
L3 red	blinking	timeout error
	on	duplicate IP address
L4 green	blinking	IP address assigned but no communication
	on	communication established
L5 green	off	BUS OUT – Ethernet link not established
	on	BUS OUT – Ethernet link established
L6 yellow	off	BUS OUT – Ethernet activity not detected
	blinking	BUS OUT – Ethernet activity detected

6.5 Modbus/TCP version

LED	Status	Description
L1 green	off	BUS IN – Ethernet link not established
	on	BUS IN – Ethernet link established
L2 yellow	off	BUS IN – Ethernet activity not detected
	blinking	BUS IN – Ethernet activity detected
L3 red	blinking	system error
	on	communication error
L4 green	off	not ready
	blinking (1 Hz)	ready but not configured yet
	blinking (5 Hz)	configured but waiting for connection
	on	communication established
L5 green	off	BUS OUT – Ethernet link not established
	on	BUS OUT – Ethernet link established
L6 yellow	off	BUS OUT – Ethernet activity not detected
	blinking	BUS OUT – Ethernet activity detected

6.6 POWERLINK version

LED	Status	Description
L1 green	off	BUS IN – Ethernet link not established
	on	BUS IN – Ethernet link established
	blinking	BUS IN – Ethernet activity detected
L3 red	on	communication error
L4 green	off	initialization status
	blinking	stop status
	single blinking	Pre-Operational 1 status
	double blinking	Pre-Operational 2 status
	triple blinking	ReadyToOperate status
	on	Operational status
L5 green	off	BUS OUT – Ethernet link not established
	on	BUS OUT – Ethernet link established
	blinking	BUS OUT – Ethernet activity detected

6.7 PROFINET IO version

LED	Status	Description
L1 green	off	BUS IN – Ethernet link not established
	on	BUS IN – Ethernet link established
L2 yellow	off	BUS IN – Ethernet activity not detected
	blinking	BUS IN – Ethernet activity detected
L3 red	off	communication established
	blinking (2 Hz)	no communication
	on	no or slow Ethernet connection
L4 green	blinking (1 Hz, 3 s)	device identification
L5 green	off	BUS OUT – Ethernet link not established
	on	BUS OUT – Ethernet link established
L6 yellow	off	BUS OUT – Ethernet activity not detected
	blinking	BUS OUT – Ethernet activity detected

6.8 CC-Link IE Field Basic version

LED	Status	Description
L1 green	off	station not connected to Ethernet network
	blinking	station connected with sending/receiving Ethernet packets
	on	station connected but does not send/receive Ethernet packets
L3 red	on	station disconnected and cyclic transmission off
	blinking	communication error
L4 green	on	station in operational and cyclic transmission on
	blinking	station in operational and cyclic transmission off
	off	station disconnected

6.9 SERCOS III version

LED	Status	Description
L1 green	off	BUS IN – Ethernet link not established
	on	BUS IN – Ethernet link established
	blinking	BUS IN – Ethernet activity detected
L3 red	on	communication error
L4 green	off	no communication (NRT mode)
	on	communication established (CP4 phase)
L5 green	off	BUS OUT – Ethernet link not established
	on	BUS OUT – Ethernet link established
	blinking	BUS OUT – Ethernet activity detected

7 Communication interface

Data exchanged by the instrument can be input data or output data. For the addresses of the communication interface used, see chapter 11. In this manual the abbreviations of the registers are used instead of the extended names.

7.1 Data exchanged

Output data from instrument (reading)	Abbreviation	Size (byte)
Gross weight	GW	4
Net weight	NW	4
Exchange register R1	R1	4
Exchange register R2	R2	2
Status register 1	SR1	2
Status register 2	SR2	1
Instrument status	IS	1
Execution register	EXR	2
Digital inputs status	INS	1
Digital outputs status	OUTS	1

Input data to instrument (writing)	Abbreviation	Size (byte)
Command register	CMDR	2
Digital outputs command	CMDOUT	2
Exchange register W1	W1	4
Exchange register W2	W2	2

Gross weight (GW) – net weight (NW)

The weight values are expressed as positive integer numbers, including decimal figures, but without decimal point. Read the status register to obtain information about sign and possible errors on the weight.

Exchange registers (R1, R2, W1, W2)

These registers are used for instrument management operations. Two read and two write exchange registers are available.

7.2 Status registers

Status register 1 (SR1)

Bit	Meaning	Bit	Meaning
0	load cell error	8	net weight negative sign
1	AD converter malfunction	9	peak weight negative sign
2	maximum weight exceeded by 9 divisions	10	net indication
3	gross weight higher than 110 % of full scale	11	weight stability
4	gross weight beyond 999999 or less than –999999	12	weight within ±1/4 of a division around ZERO
5	net weight beyond 999999 or less than –999999	13	–
6	–	14	–
7	gross weight negative sign	15	–

Status register 2 (SR2)

Bit	Meaning	Bit	Meaning
0	preset tare enabled	4	–
1	instrument ready	5	–
2	–	6	checksum error
3	–	7	bus error

Instrument status (IS)

This register is used for the LOAD program only. Alarms: see chapter 13.

Value	Meaning	Value	Meaning
0	instrument in idle condition (weight indication)	13	**SLAVE** alarm
1	batching not possible / programming mode	14	**EMPTY** alarm
2	batching phase	15	**MASFOR** alarm
3	waiting phase	16	**------** alarm
4	cycle end phase	17	**TARE?** alarm
5	batching paused	18	**LOAD** alarm
6	**UNLOAD** alarm	19	**PARSER** alarm
7	**FALL** alarm	20 ... 23	–
8	**TOL** alarm	24	temporary notice **TOTAL**
9	–		
10	**ERWEIG** alarm		
11, 12	–		

Inputs (INS) and outputs (OUTS) status

Bit	INS – digital inputs status	Bit	OUTS – digital outputs status
0	INPUT 1 status	0	OUTPUT 1 status
1	INPUT 2 status	1	OUTPUT 2 status
2 ... 7	–	2	OUTPUT 3 status
		3 ... 7	–

INS: bit = 1 high input, bit = 0 low input. OUTS: bit = 1 output closed, bit = 0 output open.

Digital outputs command (CMDOUT)

This register is used for the BASE program only; it allows to control the outputs set to PLC mode (section 9.6). Bit 0: OUTPUT 1, bit 1: OUTPUT 2, bit 2: OUTPUT 3 (bit = 1 output closed, bit = 0 output open); bits 3 ... 14 not used; bit 15: force outputs.

Note Setting bit 15 to 1 on the PLC, the master takes control of all the outputs, whatever their setting.

7.3 Command execution status (EXR, AEXR)

The execution register EXR allows you to monitor the progress of a command previously sent to CMDR. It is also available in the instrument output data and can be read without sending a command to CMDR. It may take several seconds to execute some commands.

EXR value	Description
command code sent to CMDR	command executed correctly
0	no command running
1	command running
0xFFFA	command not recognized
0xFFFB	command not available in the current configuration
0xFFFC	command requires a qualified access
0xFFFD	execution error
0xFFFE	parameter value outside the allowed limits

AEXR gives the error details, where applicable:

AEXR value	Description
0	no details
1	sample weight equal to zero
2	maximum number of calibration points reached
3	sample weight already used in the current calibration
10	preset tare equal to zero
11	semi-automatic tare active: preset tare not allowed
12	gross weight equal to zero
19	unstable weight
20	gross weight greater than the maximum capacity
25	start contact closed on batching

Reading: send command 1999 to CMDR; read EXR in the two H bytes of R1 and AEXR in the two L bytes of R1. Example – content of R1 when the maximum number of calibration points is exceeded:

	H (2 byte)	L (2 byte)	Total
Hexadecimal	0xFFFD	0x0002	0xFFFD0002
Decimal	–3	2	–196606

7.4 Commands to the command register (CMDR)

Certain data, when specifically indicated, are written directly in the EEPROM memory. This memory has a limited number of writing operations (100000), therefore pay particular attention not to execute useless operations on these locations. The instrument in any case makes sure that no writing occurs if the value to be memorised is equal to the value in memory.

Instrument information

Code	Command	Code	Command
1220	SW, HW and REV reading	1221	year of production and serial number reading

Calibration and system parameters

Code	Command	Code	Command
7	semi-automatic tare activation	6025	filter reading
8	semi-automatic zero	6026	filter writing
9	semi-automatic tare deactivation	6027	automatic zero setting at power-on reading
87	preset tare reading	6028	automatic zero setting at power-on writing
88	preset tare writing	6029	unit of measure reading
100	zero-setting for calibration	6030	unit of measure writing
101	sample weight storage	6033	coefficient reading
102	sample weight reading	6034	coefficient writing
103	sample weight writing	6043	theoretical zero reading
104	real calibration deleting	6044	theoretical zero writing
106	acquisition of multiple real calibration points	6045	recalculated full scale reading
107	sample weight mV/V reading	6101	resettable weight for small weight changes reading
108	sample weight mV/V writing	6102	resettable weight for small weight changes writing
109	calibration point acquisition via characterization values	6103	zero tracking reading
112	calibration zero point acquisition via characterization values	6104	zero tracking writing
113	total reset weight reading	6127	anti-peak activation reading
130	preset tare application	6128	anti-peak activation writing
1999	EXR and AEXR reading	6129	coefficient activation reading
6000	theoretical full scale writing	6130	coefficient activation writing
6001	theoretical full scale reading	6131	peak activation and peak weight reading
6007	sensitivity reading	6132	peak activation writing
6008	sensitivity writing	6579	stability mode writing
6009	e/divisions reading	6580	stability mode reading
6010	e/divisions writing	6581	stability time writing
6015	maximum capacity reading	6582	stability time reading

Code	Command	Code	Command
6016	maximum capacity writing		

Inputs/outputs settings and test

Code	Command	Code	Command
1122	inputs configuration reading	1125	outputs configuration writing
1123	inputs configuration writing	6137	start mV test
1124	outputs configuration reading		

Setpoint and hysteresis

Code	Command	Code	Command
90	setpoint 1 reading	162	hysteresis 1 reading
91	setpoint 2 reading	163	hysteresis 2 reading
92	setpoint 3 reading	164	hysteresis 3 reading
93	setpoint 1 writing	165	hysteresis 1 writing
94	setpoint 2 writing	166	hysteresis 2 writing
95	setpoint 3 writing	167	hysteresis 3 writing
99	data storage to EEPROM		

Batching operation, constants and formulas

Code	Command	Code	Command
1000	maximum weight reading	1032	no product load time reading
1001	maximum weight writing	1033	no product load time writing
1002	minimum weight reading	1034	no product unload time reading
1003	minimum weight writing	1035	no product unload time writing
1004	safe emptying time reading	1042	fall mode reading
1005	safe emptying time writing	1043	fall mode writing
1006	waiting time reading	1044	fall divisions reading
1007	waiting time writing	1045	fall divisions writing
1012	manual fall reading	1052	consumption activation reading
1013	manual fall writing	1053	consumption activation writing
1016	tolerance reading	1062	slave configuration reading
1017	tolerance writing	1063	slave configuration writing
1020	slow reading	1096	no comparison time reading
1021	slow writing	1097	no comparison time writing
1022	slow ON reading	2030	formula number and cycles to be batched reading
1023	slow ON writing	2031	formula number and cycles to be batched writing
1024	slow OFF reading	2035	formula set reading
1025	slow OFF writing	2036	formula set writing
1026	autotare reading	2037	formula preset reading
1027	autotare writing	2038	formula preset writing
1028	autotare delay reading	2040	formulas deleting
1029	autotare delay writing	6559	operation settings writing
1030	stable tare reading	6560	operation settings reading
1031	stable tare writing		

Commands and data related to the batching in progress

Code	Command	Code	Command
201	batching start	1085	totals deleting
202	batching pause	1114	batching data status reading
203	batching resume	2020	totals reading
204	batching stop	2032	running cycle reading
205	accept alarm during the batching	2100	batching data reading
206	cancel **TARE?** alarm	2101	batching data reading: actual batched
207	cancel **TOL** alarm	2102	batching data reading: theoretical batched
209	continue batching	2103	batching data reading: starting tare
250	batching data reading complete	2105	batching data reading: alarms

8 Commissioning and calibration

8.1 Program selection and default values

Via the configuration software it is possible to carry out the following operations (reserved for the installer):

- Restore default values.
- Program selection: BASE – basic program, setpoint management only; LOAD – single product loading program.

Important By confirming, the instrument is restored to default and data is erased.

8.2 Instrument commissioning

Check that when loading the load cells there is an increase in weight. If there is not, check and verify the connections and correct positioning of the load cells.

- If the instrument has already been theoretically calibrated (plant system identification tag present on the instrument and on the cover: load cell's rated data already entered): reset to zero (section 8.6); check the calibration with sample weights and correct the indicated weight if necessary (section 8.8).
- If the instrument has not been calibrated (missing plant system identification tag), proceed with calibration: if load cell data are unknown, follow the procedure in section 8.8 (real calibration with sample weights); if the characterization values of the load cells are known, follow the procedure in section 8.9; enter the rated data of the load cells following section 8.4 (theoretical calibration); check the calibration with sample weights.
- If you use the analogue output, set the desired analogue output type and the full scale value (section 9.12).

BASE program only

- If setpoints are used, set the required weight values and the relevant parameters (sections 9.13 and 9.6).

LOAD program only – required settings for the first batching

- Set the minimum weight value (section 10.4).
- Set the operation settings (section 10.3).
- Set formula 01 (section 10.5).
- Start the batching by closing the START contact or remotely.

8.3 Instrument information

Command sent to CMDR	Register to read	Register contents
1220	R1 (16 most significant bits)	software code
	R1 (16 least significant bits)	firmware version
	R2	hardware code
1221	R1 (16 most significant bits)	year of production
	R1 (16 least significant bits)	serial number
	R2	program code: 0 = BASE; 13 = LOAD

8.4 Theoretical calibration

This function allows the load cell rated values to be set. To perform the theoretical calibration, set in sequence the values of theoretical full scale, sensitivity and division.

Important By modifying the theoretical full scale, the sensitivity or the division: the real calibration is cancelled and only the theoretical calibration is considered valid; the system parameters containing a weight value are set to default values.

8.4.1 Theoretical full scale

Default: 10000. The system full scale is given by one cell capacity multiplied by the number of cells used. Example: 4 cells of 1000 kg – full scale = 1000 × 4 = 4000. The instrument is supplied with a theoretical full scale value of 10000. To restore factory values, set 0 as full scale.

Writing	Reading
Write the value in W1. Send command 6000 to CMDR.	Send command 6001 to CMDR. Read the value in R1.

8.4.2 Sensitivity

Default: 2.00000 mV/V. The sensitivity is a load cell rated parameter expressed in mV/V. Set the average sensitivity value indicated on the load cells; values between 0.50000 and 7.00000 mV/V are possible. Example: 4-cell system with sensitivity 2.00100, 2.00150, 2.00200, 2.00250; enter 2.00175, calculated as (2.00100 + 2.00150 + 2.00200 + 2.00250) / 4.

Writing	Reading
Multiply the value by 100000. Write the value in W1. Send command 6008 to CMDR.	Send command 6007 to CMDR. Read the value in R1. Divide the value by 100000.

Example: to set the sensitivity to 2.00175, write 200175 in W1 and send command 6008 to CMDR.

8.4.3 Division

The division is the minimum weight increment value which can be managed. It is automatically calculated by the system according to the performed calibration, so that it is equal to 1/10000 of full scale. It can be changed between 0.0001 and 100 with x1 x2 x5 x10 increments.

Index	Division	Active decimals	Index	Division	Active decimals
0	100	0	10	0.05	2
1	50	0	11	0.02	2
2	20	0	12	0.01	2
3	10	0	13	0.005	3
4	5	0	14	0.002	3
5	2	0	15	0.001	3
6	1	0	16	0.0005	4
7	0.5	1	17	0.0002	4
8	0.2	1	18	0.0001	4
9	0.1	1			

Writing	Reading
Write the index (DIVISIONS table) in W1. Send command 6010 to CMDR.	Send command 6009 to CMDR. Read the index (DIVISIONS table) in R1.

Important When a parameter is expressed as a weight value, consider the division and the active decimals set on the instrument: the value must be multiplied or divided by 10 to the power of n (n = active decimals, see table above) and rounded to the set division.

Weight value to set	Division	Active decimals	Value to write in the register	Value rounded to the division
100	0.1	1	1000 (100 × 10)	100.0
12.00	0.05	2	1200 (12.00 × 100)	12.00
33	5	0	33 (33 × 1)	35
20.123	0.002	3	20123 (20.123 × 1000)	20.122

Weight value read by the instrument	Division	Active decimals	Corresponding weight value
1000	0.1	1	100.0 (1000 / 10)
1200	0.05	2	12.00 (1200 / 100)
35	5	0	35 (35 / 1)
20122	0.002	3	20.122 (20122 / 1000)

8.5 Maximum capacity (BASE program)

From 0 to full scale; default: 0. When the gross weight exceeds this value by 9 divisions, the ------ alarm is activated. To disable this function, set 0.

Writing	Reading
Write the value in W1. Send command 6016 to CMDR.	Send command 6015 to CMDR. Read the value in R1.

8.6 Tare weight zero setting

Perform this procedure after having set the theoretical calibration data. Use this function to set to zero the weight of the empty system after commissioning and later on to compensate zero variations due to product residues.

Tare weight zero setting	Reading of the total reset weight value
Send command 100 to CMDR.	Send command 113 to CMDR. Read the value in R1.

8.7 Zero value manual entry

Important Perform this procedure only if it is not possible to reset the weighed structure tare, for example because it contains product that cannot be unloaded.

Set in this parameter the estimated zero value (from 0 to 999999; default: 0).

Writing	Reading
Write the value in W1. Send command 6044 to CMDR.	Send command 6043 to CMDR. Read the value in R1.

8.8 Real calibration (with sample weights)

After having performed the theoretical calibration and the tare weight zero setting, this function allows correct calibration to be done using sample weights of known value and, if necessary, any deviations of the indicated value from the correct value to be corrected.

Example: for a system of maximum capacity 1000 kg and 1 kg division, two sample weights are available, one of 500 kg and the other one of 300 kg. Load both weights onto the system and correct the indicated weight to 800. Now remove the 300 kg weight, the system must show 500; remove the 500 kg weight too; the system must read zero. If this does not happen, there is a mechanical problem affecting the system linearity.

Important Identify and correct any mechanical problems before repeating the procedure.

- If theoretical full scale and full scale recalculated in real calibration are equal, the theoretical calibration is currently in use; otherwise the real calibration based on sample weights is in use.
- If the correction changes the previous full scale by more than 20 %, all parameters with settable weight values are reset to default values.
- Linearisation option: up to 8 points, using eight different sample weights.

Note To set a sample weight of negative value, consider the contents of the register you write in as a 32-bit signed number. If the development system does not handle signed numbers, enter the values in two's complement. Example: sample weight –56 kg = 0xFFFFFFC8.

Acquisition of a single calibration point	Acquisition of multiple calibration points
Load onto the weighing system a sample weight equal to at least 50 % of the maximum quantity to be weighed. Write the weight value in W1. Send command 103 to CMDR. Send command 101 to CMDR.	Load onto the weighing system a sample weight. Write the loaded weight value in W1. Send command 103 to CMDR. Send command 106 to CMDR. Repeat the procedure up to a maximum of 8 weights.

- When acquiring a single calibration point, the instrument replaces the existing calibration with the new one.
- Before performing a multi-point calibration again, reset the value of all calibration points by sending command 104 to CMDR.
- Full scale recalculated in real calibration: send command 6045 to CMDR and read the value in R1.

8.9 Calibration via characterization values of the load cell

After performing the theoretical calibration, this function enables calibration using the characterization values of the load cell in use (certificate of calibration or linearity test). The necessary values are the pairs of force and mV/V defined on the first load cycle with growing loads.

Note The instrument manages a single type of calibration at a time: calibration via characterization values deletes and replaces the real calibration present.

Force [kgf]	mV/V
0.00	0.001752
393.71	0.391151
793.65	0.794584
1193.58	1.197985
1593.61	1.601605
1993.65	2.005155

Example of characterization values. The first row corresponds to the zero point: first enter the force–mV/V pair of the zero point, then the pairs of the points recorded during the characterization of the load cell. If the force values are in newton, convert them into kgf with kgf = N / g, where g is the gravity acceleration equal to 9.80665 m/s^2, unless otherwise specified on the characterization document.

To verify the calibration, load a known weight on the system and check the reading, then remove the weight and verify that the system goes back to zero; if this does not happen, there is a mechanical issue on the system altering its linearity. Identify and correct any mechanical problems before repeating the procedure. The notes on full scale and on the 20 % limit of section 8.8 apply accordingly.

Zero point writing	Calibration points writing
Multiply the force value of the zero point by 100. Write the value in W1. Send command 103 to CMDR. Multiply the mV/V value of the zero point by 1000000. Write the value in W1. Send command 108 to CMDR. Send command 112 to CMDR.	Multiply the force value of the first characterization point by 100. Write the value in W1. Send command 103 to CMDR. Multiply the mV/V value of the first characterization point by 1000000. Write the value in W1. Send command 108 to CMDR. Send command 109 to CMDR. Repeat the sequence for all the points of the characterization document.

Operation	Value to set	Value to write in W1	Command to CMDR
Force writing (zero point)	0.00	0 (0 × 100)	103
mV/V writing (zero point)	0.001752	1752 (0.001752 × 1000000)	108
Calibration zero point acquisition	–	–	112
Force writing (point)	393.71	39371 (393.71 × 100)	103
mV/V writing (point)	0.391151	391151 (0.391151 × 1000000)	108
Calibration point acquisition	–	–	109

Negative values as 32-bit signed numbers (two's complement), for example force –400.00 kgf = –40000 = 0xFFFF63C0; mV/V –0.001234 = –1234 = 0xFFFFFB2E. Before performing a calibration again, reset all calibration points with command 104. Full scale recalculated in the calibration via characterization values: send command 6045 to CMDR and read the value in R1.

9 Functions and parameters

9.1 Overview

Sections marked BASE program or LOAD program apply only to that program (section 8.1); all other functions apply to both.

9.2 Filter on the weight

Default: type 0, level 4. Setting this parameter allows a stable weight indication to be obtained. Available filter types: type 0 – standard filter; type 1 – stable moving average filter (better noise absorption); type 2 – fast moving average filter (faster settling time); see the table below.

Type 0: level	Settling time [ms]	FC ID	FC [Hz]	Type 1: settling [ms]	Type 2: settling [ms]
0	12	0	0.1	6400	4500
1	150	1	0.2	3200	2300
2	260	2	0.3	2200	1600
3	425	3	0.5	1300	1100
4	850	4	0.8	800	700
5	1700	5	1	650	550
6	2500	6	2	320	260
7	4000	7	3	220	180
8	6000	8	5	130	120
9	7000	9	10	65	60
		10	20	35	27
		11	30	20	18
		12	50	12	11
		13	no filter	2500/WPS	2500/WPS

Weight refresh frequency WPS (loads per second):

Type 0: level	WPS [loads/s]	Type 1 and 2: WPS ID	WPS [loads/s]
0	300	0	5
1	100	1	10
2	50	2	12.5
3	25	3	25
4	12.5	4	50
5	12.5	5	100
6	12.5	6	250
7	10	7	300
8	10	8	500
9	5	–	–

Type 0

Select the level (table above). The weight refresh frequency WPS is determined by the selected level. To increase the effect (weight more stable) increase the level.

Type 1 and type 2

Select the cut-off frequency FC (from 0.1 to 50 Hz, or no filter) and the weight refresh frequency WPS (from 5 to 500 loads/s). Not all WPS and FC combinations are allowed (x allowed, – not allowed):

Type 1 filter configurations (rows WPS, columns FC in Hz; NF = no filter)

WPS	0.1	0.2	0.3	0.5	0.8	1	2	3	5	10	20	30	50	NF
5	x	x	x	x	x	x	–	–	–	–	–	–	–	x
10	x	x	x	x	x	x	x	–	–	–	–	–	–	x
12.5	x	x	x	x	x	x	x	–	–	–	–	–	–	x
25	–	x	x	x	x	x	x	x	x	–	–	–	–	x
50	–	–	x	x	x	x	x	x	x	x	–	–	–	x
100	–	–	–	x	x	x	x	x	x	x	x	–	–	x
250	–	–	–	–	–	–	x	x	x	x	x	x	x	x
300	–	–	–	–	–	–	x	x	x	x	x	x	x	x
500	–	–	–	–	–	–	–	x	x	x	x	x	x	x

Type 2 filter configurations (rows WPS, columns FC in Hz; NF = no filter)

WPS	0.1	0.2	0.3	0.5	0.8	1	2	3	5	10	20	30	50	NF
5	x	x	x	x	x	x	–	–	–	–	–	–	–	x
10	x	x	x	x	x	x	x	–	–	–	–	–	–	x
12.5	x	x	x	x	x	x	x	x	–	–	–	–	–	x
25	–	x	x	x	x	x	x	x	x	–	–	–	–	x
50	–	–	–	x	x	x	x	x	x	x	–	–	–	x
100	–	–	–	–	x	x	x	x	x	x	x	–	–	x
250	–	–	–	–	–	–	x	x	x	x	x	x	x	x
300	–	–	–	–	–	–	–	x	x	x	x	x	x	x
500	–	–	–	–	–	–	–	–	x	x	x	x	x	x

Examples type 1: for WPS 100 loads/s the available cut-off frequencies range from 0.5 to 20 Hz; for FC 0.1 Hz the available WPS range from 5 to 12.5 loads/s. Examples type 2: for WPS 100 loads/s the cut-off frequencies range from 0.8 to 20 Hz; for FC 0.1 Hz the WPS range from 5 to 12.5 loads/s.

Writing	Reading
Write the filter type in the two H bytes of W1. Write the level or FC ID in the two L bytes of W1. Write the WPS ID in W2 (meaningless if type = 0). Send command 6026 to CMDR.	Send command 6025 to CMDR. Read the type in the two H bytes of W1. Read the level or FC ID in the two L bytes of W1. Read the WPS ID in W2.

Example	W1 H (2 byte)	W1 L (2 byte)	W1 total	W2 (2 byte)
Type 1, WPS 25, FC 1 Hz – hexadecimal	0x0001	0x0005	0x00010005	0x0003
Type 1, WPS 25, FC 1 Hz – decimal	1	5	65541	3
Type 0, level 6 – hexadecimal	0x0000	0x0006	0x00000006	–
Type 0, level 6 – decimal	0	6	6	–

Anti-peak

Default: enabled. When the weight is stable, the anti-peak filter removes any sudden disturbances with a maximum duration of 1 second.

Writing	Reading
Write the enabling status (1 = enabled; 0 = disabled) in W1. Send command 6128 to CMDR.	Send command 6127 to CMDR. Read the enabling status (1 = enabled; 0 = disabled) in R1.

9.3 Zero parameters

Resettable weight setting for small weight changes

Maximum resettable weight: from 0 to full scale; default: 300 (considered decimals: 300 – 30.0 – 3.00 – 0.300). This parameter indicates the maximum weight value resettable by external contact or protocol.

Writing	Reading
Write the value in W1. Send command 6102 to CMDR.	Send command 6101 to CMDR. Read the value in R1.

Automatic zero setting at power-on

Auto zero: from 0 to 10 % of full scale; default: 0. If at switch-on the weight value is lower than the value set in this parameter, the weight is reset. To disable this function, set 0.

Writing	Reading
Write the value in W1. Send command 6028 to CMDR.	Send command 6027 to CMDR. Read the value in R1.

Zero tracking

From 0 (off) to 5; default: 0. When the weight value is stable and, after a second, it deviates from zero by a figure in divisions smaller than or equal to the figure set in this parameter, the weight is set to zero. To disable this function, set 0. Example: with division 5 and zero tracking 2, the weight is automatically set to zero for variations smaller than or equal to 10 (division × zero tracking).

Writing	Reading
Write the value (0 = function disabled) in W1. Send command 6104 to CMDR.	Send command 6103 to CMDR. Read the value (0 = function disabled) in R1.

9.4 Stability

Mode (default: MODE0) selects how the weight is considered stable:

- MODE0: the weight value must remain within the same division for a time greater than or equal to the stability time.
- MODE1: the variation of the weight value must be less than or equal to a division for a time greater than or equal to the stability time.

Writing	Reading
Write the value (0 = MODE0; 1 = MODE1) in W1. Send command 6579 to CMDR.	Send command 6580 to CMDR. Read the value (0 = MODE0; 1 = MODE1) in R1.

Stability time: from 0.1 to 3.0 s; default: 1.0 s. The time is expressed in tenths of a second; example: to set 2.2 seconds, write 22 in W1.

Writing	Reading
Write the value in W1. Send command 6581 to CMDR.	Send command 6582 to CMDR. Read the value in R1.

9.5 Units of measure and display coefficient

Unit of measure (default: 0):

Index	Unit of measure	Effect of coefficient on weight
0	kilograms	no effect
1	grams	no effect
2	tons	no effect
3	pounds	multiplies
4	newton	multiplies
5	litres	divides
6	bar	multiplies
7	atmospheres	multiplies
8	pieces	divides
9	newton metres	multiplies
10	kilogram metres	multiplies
11	other	multiplies

Writing	Reading
Write the unit of measure index in W1. Send command 6030 to CMDR.	Send command 6029 to CMDR. Read the unit of measure index in R1.

Display coefficient (BASE program)

Coefficient: max. settable value 99.9999; default: 1.0000. It has different meanings according to the selected unit of measure (table above); the weight indication is modified based on this value. If one of the inputs is set to COEFFICIENT mode (section 9.6), with the input closed the weight is indicated based on the coefficient; with the input open the normal weight indication returns.

Important All other settings (setpoint, hysteresis, calibration ...) are expressed as weight values. To convert them to the new unit of measure, change the system calibration with one of the following procedures; the coefficient must remain set to 1.0000.

– Theoretical calibration: set as theoretical full scale the full scale value divided by the conversion coefficient from kg to the new unit. Example: 4 load cells of 1000 kg under a scale for olive oil with a specific gravity of 0.916 kg/l – full scale = (4 × 1000) / 0.916 = 4367; the system works in litres of olive oil.

– Real calibration: load a known quantity of product litres on the scale (at least 50 % of the maximum amount to be weighed) and acquire a single real calibration point by entering the value in litres of the loaded product (section 8.8).

Writing	Reading
Write the coefficient in W1. Send command 6034 to CMDR. Write the enabling status (1 = enabled; 0 = disabled) in W1. Send command 6130 to CMDR.	Send command 6033 to CMDR. Read the coefficient in R1. Send command 6129 to CMDR. Read the enabling status in R1.

9.6 Outputs and inputs configuration (BASE program)

Outputs

– Normal state (default: OPEN). OPEN (normally open): the relay is de-energised and the contact is open when the weight is lower than the programmed setpoint value; it closes when the weight is higher than or equal to the setpoint. CLOSE (normally closed): the relay is energised and the contact is closed when the weight is lower than the setpoint; it opens when the weight is higher than or equal to the setpoint.

– Mode (default: SETPOINT). SETPOINT: the contact switches on the basis of weight, according to the setpoint (section 9.13). PLC: the contact does not switch on the basis of weight but is managed remotely via CMDOUT. STABLE: relay switching occurs when the weight is stable.

In SETPOINT mode the following options are also active:

– Weight (default: GROSS). GROSS: the contact switches on the basis of gross weight. NET: the contact switches on the basis of net weight (if the net function is not active, on the basis of gross weight).

– Positive/negative (default: POSITIVE AND NEGATIVE). POSITIVE AND NEGATIVE: switching for both positive and negative weight values. POSITIVE: for positive weight values only. NEGATIVE: for negative weight values only.

– Zero – setpoint operation on 0 value (default: OFF). ZERO OFF: relay switching does not occur if the setpoint value is 0. ZERO ON: with setpoint = 0 and switching POSITIVE AND NEGATIVE, switching occurs when the weight is 0 and again when the weight is different from zero, taking hysteresis into account (both for positive and for negative weights); with POSITIVE, switching occurs for a weight higher than or equal to 0 and again for values below 0; with NEGATIVE, switching occurs for a weight lower than or equal to 0 and again for values above 0 – each taking hysteresis into account.

OCR (outputs configuration register):

Bit 7	Bit 6 ... 5	Bit 4	Bit 3	Bit 2 ... 1	Bit 0
zero: 0 = OFF, 1 = ON	00 = POS+NEG, 01 = POS, 10 = NEG, 11 not used	0 = GROSS, 1 = NET	not used	00 = SETPOINT, 01 = PLC, 10 = STABLE, 11 not used	0 = OPEN, 1 = CLOSE

Writing	Reading
Write the OCR value in W1. Write the output number (1 ... 3) in W2. Send command 1125 to CMDR.	Write the output number (1 ... 3) in W2. Send command 1124 to CMDR. Read the output number in R2. Read the OCR value in R1.

Binary	Hexadecimal	Decimal	Output configuration
00000000	0x00	000	OPEN / SETPOINT / GROSS / POS+NEG / zero OFF
10110001	0xB1	177	CLOSE / SETPOINT / NET / POS / zero ON

Inputs

Mode (default: input 1 = ZERO, input 2 = NET/GROSS):

Index	Function	Description
1	NET/GROSS	closing the input for no more than one second performs a semi-automatic tare and the instrument indicates the net weight; to go back to the gross weight indication keep the input closed for 3 seconds
2	ZERO	closing the input for no more than one second sets the weight to zero (section 9.9)
3	PEAK	keeping the input closed, the peak weight value reached is indicated; opening the input, the current weight is indicated (section 9.10)
4	PLC	closing the input no operation is performed; the input status can be read remotely via the communication protocol
5	CONTIN	closing the input for max. one second, the weight is transmitted once over the serial connection according to the fast continuous transmission protocol (only if that protocol is set, chapter 12)
6	COEFFICIENT	with the input closed, the weight is indicated based on the set coefficient (section 9.5), otherwise the weight is indicated

Writing	Reading
Write the function index in W1. Write the input number (1 ... 2) in W2. Send command 1123 to CMDR.	Write the input number (1 ... 2) in W2. Send command 1122 to CMDR. Read the input number in R2. Read the function index in R1.

9.7 Outputs and inputs (LOAD program)

In the LOAD program, inputs and outputs are not configurable but work as follows:

Contact	Function
OUTPUT 1	PRESET (operation: section 10.3)
OUTPUT 2	SET (operation: section 10.3)
OUTPUT 3	CYCLE END (the relay closes when the cycle end is reached)
INPUT 1	START
INPUT 2	STOP

9.8 Semi-automatic tare and preset tare

Important The semi-automatic tare, the preset tare and the zero-setting of section 9.9 are lost upon instrument power-off.

Semi-automatic tare (net/gross): close the NET/GROSS input or activate the function via the communication interface; the instrument indicates the net weight (just set to zero). To return to the gross weight indication, keep the NET/GROSS input closed or deactivate the function via the communication interface. This operation can be repeated many times to allow the loading of several products. Example: put the container on the scale – the instrument indicates the container weight; close the NET/GROSS input – the net weight is zero; introduce the product – the instrument indicates the product weight. The semi-automatic tare is not allowed if the gross weight is zero.

Communication interface: send command 7 to CMDR to activate the semi-automatic tare (NW is updated), command 9 to deactivate it.

Preset tare (subtractive tare device): via the communication interface a preset tare value can be set, to be subtracted from the weight indication, provided that it is lower than or equal to the maximum weight. In the BASE program, to delete a preset tare and return to gross weight indication keep the NET/GROSS input (if any) closed for 3 seconds. If a preset tare is entered, the semi-automatic tare can still be used; the two types of tare are added.

Writing	Reading
Write the value in W1. Send command 88 to CMDR.	Send command 87 to CMDR. Read the value in R1.

To activate the preset tare, send command 130 to CMDR; to deactivate it, send command 9.

9.9 Semi-automatic zero (weight zero-setting for small variations)

Close the ZERO input (BASE program only) or carry out the operation via the communication interface (command 8 to CMDR): the weight is set to zero. This function is only allowed if the weight is lower than the maximum resettable weight (section 9.3); otherwise the weight is not set to zero.

9.10 Peak (BASE program)

By keeping the PEAK input closed or activating the function via the communication interface, the peak gross weight value reached stays indicated. By opening the input or deactivating the function, the current weight is indicated. To indicate a peak in sudden changes, set a filter with a short settling time.

Writing	Reading
Write the enabling status (1 = enabled; 0 = disabled; lost at power-off) in W1. Send command 6132 to CMDR.	Send command 6131 to CMDR. Read the enabling status in R2. Read the peak weight value in R1 (available until the next activation of the function).

9.11 Test

- Input test: close the inputs to be tested and check that INS correctly reports their status.
- Output test: force the status of the outputs to be tested in CMDOUT and check that OUTS correctly reports their status.
- Millivolt test: send command 6137 to CMDR, read the value in R1 and divide it by 10000 to get the mV.

9.12 Analogue output (RS485 + analogue version)

- Type (4 ... 20 mA, 0 ... 20 mA, 0 ... 10 V, 0 ... 5 V; default: 4 ... 20 mA): selects the analogue output type.
- Weight: the analogue output follows the GROSS or the NET weight. If the net function is not active, the analogue output varies according to the gross weight.
- Zero: weight value for which the minimum analogue output value is obtained. Only set a value different from zero to limit the analogue output range; for instance, for a full scale of 10000 kg with 4 mA at 5000 kg and 20 mA at 10000 kg, set 5000 kg.
- Full scale: weight value for which the maximum analogue output value is obtained; it must correspond to the value set in the PLC program (default: calibration full scale). Example: 4 ... 20 mA output with 20 mA = 8000 kg in the PLC program – set 8000.

– Zero correction: if necessary, adjust the analogue output so that the PLC indicates 0. The sign "–" can be set for the last digit on the left. Example: 4 ... 20 mA output reading 4.1 mA at minimum – set 3.9 to obtain 4.0.
– Full scale correction: if necessary, adjust the analogue output so that the PLC indicates the full scale value. Example: 4 ... 20 mA output reading 19.9 mA at full scale – set 20.1 to obtain 20.0.

Analogue output type	Correction minimum	Correction maximum
0 ... 10 V	0	10.200
0 ... 5 V	0	5.500
0 ... 20 mA	0	22.000
4 ... 20 mA	3.5	22.000

The analogue output may also be used in the opposite manner: the weight set for the analogue zero may be greater than the weight set for the analogue full scale; the output then increases as the weight decreases. Example with 0 ... 10 V, zero = 10000, full scale = 0: weight 0 kg – 10 V; 5000 kg – 5 V; 10000 kg – 0 V.

9.13 Setpoint programming (BASE program)

– Setpoint (from 0 to full scale; default: 0): relay switching occurs when the weight exceeds the value set in this parameter. The type of switching is settable (section 9.6).
– Hysteresis (from 0 to full scale; default: 0): value subtracted from the setpoint to obtain contact switching for decreasing weight. Example: setpoint 100 and hysteresis 10 – the switching occurs at 90 for decreasing weight.

These values are set to zero if the calibration is changed significantly (sections 8.4 and 8.8).

Reading: send the reading command (90 ... 92 setpoint 1 ... 3, 162 ... 164 hysteresis 1 ... 3) to CMDR and read the value in R1. Writing: write the value in W1 and send the writing command (93 ... 95 setpoint 1 ... 3, 165 ... 167 hysteresis 1 ... 3) to CMDR.

Important When written, the hysteresis values are saved to RAM and EEPROM, the setpoint values to RAM only, so they are lost at the next power-off. To store them permanently to EEPROM, send command 99 to CMDR.

10 Batching (LOAD program)

10.1 Introduction to the operation

The instrument is able to load automatically a settable amount of product on the weighing structure, driving the batching device (including two-speed) through the PRESET and SET contacts. Features:

– 99 settable formulas (section 10.5);
– automatic fall calculation (section 10.4);
– autotare at batching start (section 10.4);
– tolerance error control (section 10.4);
– precision batching through slow function and through tapping function (section 10.4);
– consumption storage (sections 10.4 and 10.7).

Batching start: via external contact or remotely via fieldbus. Consumption storage: at the end of every batching the instrument stores the consumed amount for each formula; the values can be read via the communication protocol when the instrument is in standby. Alarm management: if an alarm occurs during the batching, the instrument activates it and waits for the operator in order to cancel or continue batching.

10.2 Batching sequence

The batching process consists of: batching sequence programming, batching start, batching execution, waiting phase, cycle end phase.

Batching sequence programming

Select the desired formula and the number of cycles to run.

Writing	Reading
Write the number of cycles in W1. Write the formula number in W2. Send command 2031 to CMDR.	Send command 2030 to CMDR. Read the number of cycles in R1. Read the formula number in R2.

Batching start

Start the batching by closing the START external contact for at least 0.5 s or by sending command 201 to CMDR. If at the end of the batching the START contact is closed, the same batching sequence is repeated. The instrument checks that:

- the formula has been programmed, otherwise the **EMPTY** alarm is activated;
- the amount set in the formula does not exceed the set maximum weight, otherwise the **MASFOR** alarm is activated;
- the gross weight is lower than the minimum weight, otherwise the **TARE?** alarm is shown (batching start can be forced by sending command 206 to CMDR);
- only if consumption for each formula is enabled: if the consumed amount exceeds 999000, the **TOTAL** warning is activated for one second; if it exceeds 999999, it is automatically set to zero.

Once these conditions have been verified, the instrument proceeds to the batching execution phase.

Batching execution

The batching consists of an initial FAST phase and a subsequent SLOW phase. During the entire batching execution, the instrument monitors the weight of the batched quantity, commands the PRESET and SET contacts according to the **PSS** setting (section 10.3) and, if the no product load time is set and the product is not loaded by at least 20 divisions within this interval, activates the **LOAD** alarm.

The FAST phase ends when the batched quantity has reached the set value minus the slow value (only if slow is set), or the preset value set in the formula. During the SLOW phase: if the no comparison time is set, the instrument does not verify the reaching of the set value until that time has elapsed; if a tapping value has been set, the SET contact performs opening and closing cycles according to the slow ON and slow OFF times. When the batched quantity reaches the set value of the formula minus any fall value, the SLOW phase ends and the SET contact opens, interrupting the product flow.

Waiting phase

After opening the SET contact, the enabled wait phase ending conditions are taken into consideration: time interval – the instrument waits for the waiting time; command – it waits for the START input to be closed or command 209 to be sent to CMDR; stable weight – it waits for the weight to be stable.

If the tolerance is set, three conditions can occur: the batched quantity is less than the set quantity minus the tolerance – the SLOW phase is performed again to improve the accuracy, and if the error persists the **TOL** alarm is activated; the batched quantity is greater than the set quantity plus the tolerance – the **TOL** alarm is activated; the batched quantity is within the tolerance limits. To cancel the **TOL** alarm and proceed, send command 207 to CMDR. When all the set conditions are met, the waiting phase ends and the batching cycle continues.

Cycle end phase

- The CYCLE END contact is closed.
- Only if consumption for each formula is enabled: consumption is stored.
- From the beginning of the product extraction, if the no product unload time is set and the product is not extracted by at least 20 divisions within this interval, the **UNLOAD** alarm is activated.

The instrument ends the batching and opens the CYCLE END contact only after verifying that the weight is lower than the minimum weight and the safe emptying time has elapsed. Only if waiting confirmation from PC is enabled, the instrument waits for remote data reading before being available for a new batching; to confirm the reading, send command 250 to CMDR. If several batching cycles have been set, the instrument starts a new cycle.

10.3 Operation settings

- **NEXT P** – wait phase ending conditions, i.e. the switch conditions from the SET opening to the CYCLE END closing: TIME (default: YES) – waiting time set in the constants; COMMAND (default: NO) – START input closure or command 209 to CMDR; STABLE (default: NO) – stable weight.

– **PSS** (default: 2) – operating mode of the SET and PRESET contacts. **PSS** = 1: at batching start only the PRESET contact is closed; when the preset value is reached it opens and the SET contact closes; when the final set value is reached it opens. **PSS** = 2: at batching start SET and PRESET close simultaneously; when the preset value is reached PRESET opens (beginning of the slow phase); when the set value is reached SET opens too. For single-speed batching program **PSS** = 2 and use only the SET contact. **PSS** = 3: at batching start only PRESET is closed; when the preset value is reached SET closes too; when the final set value is reached both open.

– **ENDnet** (default: NO) – weight indicated during the CYCLE END phase (unloading of the scale at the end of batching): YES – net weight during the cycle end, gross weight after the CYCLE END opens; NO – gross weight during the cycle end.

BCR (batching configuration register):

Bit 7	Bit 6	Bit 5 ... 4	Bit 3	Bit 2	Bit 1	Bit 0
ENDnet	not used	PSS	not used	NEXT P: STABLE	NEXT P: COMMAND	NEXT P: TIME
0 = NO, 1 = YES	0	00 not used, 01 = 1, 10 = 2, 11 = 3	0	0 = NO, 1 = YES	0 = NO, 1 = YES	0 = NO, 1 = YES

Writing	Reading
Write the BCR value in W1. Send command 1133 to CMDR.	Send command 1132 to CMDR. Read the BCR value in R1.

Note The command list (section 7.4) gives 6559 (writing) and 6560 (reading) for the operation settings. If a command is not accepted, please contact octogon.

Binary	Hex	Decimal	ENDnet	PSS	STABLE	COMMAND	TIME
00010010	0x12	018	NO	1	NO	YES	NO
10110001	0xB1	177	YES	3	NO	NO	YES
10100110	0xA6	166	YES	2	YES	YES	NO

10.4 Batching constants

Important The time values of the batching constants are expressed in tenths of a second. Example: to set the safe emptying time to 10.2 seconds via the communication interface, write 102 in W1 and send command 1005 to CMDR.

Minimum weight

From 0 to full scale; default: 10. Value at which the scale is considered empty. Batching start is only allowed if the weight is lower than this value; during the unloading phase the CYCLE END contact is opened when the weight reaches this value and after the safe emptying time is over.

Writing	Reading
Write the value in W1. Send command 1003 to CMDR.	Send command 1002 to CMDR. Read the value in R1.

Maximum weight

From 0 to full scale; default: 0. Maximum weight that can be indicated and set. The indicated weight exceeding this value by 9 divisions activates the `------` alarm; if in the formulas programming the weight value set is greater than this value, the **ERROR** alarm is activated and the value is not stored. Setting 0 disables the function.

Writing	Reading
Write the value in W1. Send command 1001 to CMDR.	Send command 1000 to CMDR. Read the value in R1.

Safe emptying time

From 0.0 to 999.9 s; default: 5.0. Time necessary for a perfect emptying of the scale. The instrument waits for this time during the unloading phase (CYCLE END closed), after reaching the minimum weight and before opening the CYCLE END contact.

Writing	Reading
Write the value in W1. Send command 1005 to CMDR.	Send command 1004 to CMDR. Read the value in R1.

Waiting time

From 0.0 to 999.9 s; default: 5.0. Time elapsing between the SET end batching and the CYCLE END closing to allow the weight to get steady. Only required if the automatic fall is programmed and/or consumption is enabled and/or a tolerance value has been programmed and/or the wait for remote confirmation is enabled.

Writing	Reading
Write the value in W1. Send command 1007 to CMDR.	Send command 1006 to CMDR. Read the value in R1.

No comparison time

From 0.0 to 999.9 s; default: 0.0. Waiting time during batching, after the opening of PRESET, before comparing the weight with the programmed SET value.

Writing	Reading
Write the value in W1. Send command 1097 to CMDR.	Send command 1096 to CMDR. Read the value in R1.

No product load time

From 0.0 to 999.9 s; default: 0.0. Product control during batching: if there is no product load, the instrument waits for this time before activating the **LOAD** alarm.

Writing	Reading
Write the value in W1. Send command 1033 to CMDR.	Send command 1032 to CMDR. Read the value in R1.

No product unload time

From 0.0 to 999.9 s; default: 0.0. Product control during the unloading phase (cycle end): if there is no product extraction, the instrument waits for this time before activating the **UNLOAD** alarm. The control is only actuated after unloading of the product has started (the weight must decrease by at least 10 divisions).

Writing	Reading
Write the value in W1. Send command 1035 to CMDR.	Send command 1034 to CMDR. Read the value in R1.

Fall

Fall is the product amount still falling after the batching stop; it adds to the product already batched and causes inaccuracy. The instrument anticipates the batching stop to reduce this uncertainty in two ways: AUTOMATIC fall – the instrument calculates the fall; MANUAL fall – the instrument applies the fall set by the operator. Set a waiting time such that the weight is stable at the end of the batching, otherwise the update of the automatic fall is not correct.

– Manual/automatic (from 1 to 99; default: 0): 0 = MANUAL fall; a value different from 0 = AUTOMATIC fall, the value states after how many batchings the fall value is updated (e.g. 3: every three batching cycles). In cycles in which the fall is not updated, the waiting time is not applied unless other functions require it; a high value therefore reduces the duration of batchings.

– Fall tolerance (only with automatic fall; from 0 to full scale; default: 0): limit within which the automatic fall is updated according to the previous parameter. A low value gives more accuracy but may lengthen the batchings, because if necessary the fall is updated every cycle. Setting 0 disables the function. Example: manual/automatic = 3, fall tolerance = 5, weight 100: the fall is updated every batching until the batched weight is within 95 ... 105, then every 3 batchings.

– Fall (from 0 to maximum weight; default: 0): fall value for each formula (only with manual fall), or indication/modification of the fall calculated automatically.

Parameter	Writing	Reading
Manual/automatic	value in W1, command 1043	command 1042, value in R1
Fall tolerance	value in W1, command 1045	command 1044, value in R1
Fall (per formula)	formula number in W2, fall value in W1, command 1013	formula number in W2, command 1012, fall value in R1

Tolerance

From 0 to maximum weight; default: 0. Parameter for each formula that defines how much the batched weight may deviate from the formula value; beyond it the **TOL** alarm is activated. Example: SET = 1000 and tolerance = 100 – the batched weight must be between 900 and 1100 to continue. Setting 0 disables the function.

Writing	Reading
Write the formula number in W2. Write the tolerance value in W1. Send command 1017 to CMDR.	Write the formula number in W2. Send command 1016 to CMDR. Read the tolerance value in R1.

Slow

From 0 to maximum weight; default: 0. Single value valid for all the formulas in place of the preset value. When the weight has reached the SET value minus this value, the slow batching phase starts by the PRESET contact. If the value is greater than the weight to batch, the batching is in slow phase. Setting 0 disables the function. Example: SET = 100 and slow = 15 – the slow phase begins at 85.

Writing	Reading
Write the value in W1. Send command 1021 to CMDR.	Send command 1020 to CMDR. Read the value in R1.

Tapping function

If the batching device has no slow speed, this function slows down the product batching in the final phase through opening and closing cycles of the SET contact and increases the accuracy. Set in the slow parameter the product amount to be batched with the tapping function. Slow ON (0 ... 9.9; default: 0): time in which the SET relay remains closed during the SLOW phase. Slow OFF (0 ... 9.9; default: 0): time in which it remains open. Setting 0 disables the function.

Parameter	Writing	Reading
Slow ON	value in W1, command 1023	command 1022, value in R1
Slow OFF	value in W1, command 1025	command 1024, value in R1

Autotare, autotare delay, stable tare

– Autotare (0 ... 999; default: 0): automatic tare at batching start, updated every as many cycles of a single batching sequence as set here; 0 disables it. Only possible if the gross weight is lower than the minimum weight, otherwise the **TARE?** alarm is activated.

– Autotare delay (0 ... 99.9; default: 0): the instrument waits for this time after the start of the formula before performing the autotare and starting the batching. Only with autotare enabled.

– Stable tare (default: disabled): enabled – with autotare, zero-setting at batching start is done after the delay time and only when the weight is stable; disabled – right after the delay time. Only with autotare enabled.

Parameter	Writing	Reading
Autotare	value in W1, command 1027	command 1026, value in R1
Autotare delay	value in W1, command 1029	command 1028, value in R1
Stable tare	1 = enabled, 0 = disabled in W1, command 1031	command 1030, status in R1

Consumption for each formula, waiting confirmation from PC

– Consumption for each formula (default: NO): YES enables the consumption memory (total batched quantity) for each formula.

– Waiting confirmation from PC (default: disabled): enabled – the instrument waits for the PC to read the batching data before starting another batching; in case of recording failure the **SLAVE** alarm is activated. Disabled – at cycle end the instrument does not wait.

Parameter	Writing	Reading
Consumption for each formula	1 = enabled, 0 = disabled in W1, command 1053	command 1052, status in R1
Waiting confirmation from PC	1 = enabled, 0 = disabled in W1, command 1063	command 1062, status in R1

Stable tare, consumption for each formula and waiting confirmation from PC: the enabling status written via the communication interface is lost at power-off.

10.5 Formulas programming

Select the formula to program and set PRESET and SET; 99 formulas can be set. PRESET is not available if a slow value has been set in the constants. If PRESET or SET is set higher than the maximum weight, the **ERROR** message is shown.

Writing	Reading
Write the formula number in W2. Write the SET value in W1. Send command 2036 to CMDR. Write the formula number in W2. Write the PRESET value in W1. Send command 2038 to CMDR.	Write the formula number in W2. Send command 2035 to CMDR. Read the SET value in R1. Write the formula number in W2. Send command 2037 to CMDR. Read the PRESET value in R1.

Deleting formulas: write the number of the formula to be deleted in W2 (to delete all formulas write 0) and send command 2040 to CMDR.

10.6 Instrument management during the batching

– Batching in progress: send command 2032 to CMDR and read the running cycle in R1 and the formula in R2.

– Stop: open the START contact and close the STOP contact; if the START contact remains closed the batching is not stopped. Via the interface: make sure the START contact is open (check INS) and send command 204 to CMDR.

– Pause: command 202; resume: command 203.

– Alarms: command 206 cancels the **TARE?** alarm and proceeds with the batching; command 207 cancels the **TOL** alarm and proceeds; command 205 accepts the **EMPTY**, **ERWEIG**, **FALL**, **MASFOR**, **PARSER** alarms and stops the batching (chapter 13).

Batching data reading

– Send command 1114 to CMDR and read the data processing status in R1 (1 = data ready; 0 = data not ready).

– If data are ready, send command 2100 to CMDR to make them available, then read them as below.

– Only if waiting confirmation from PC is enabled: send command 250 to CMDR to confirm the data reading and proceed to a new batching.

Data	Reading
Actual batched weight	send command 2101 to CMDR; read the value in R1 and the sign in R2 (0 = positive; 1 = negative)
Theoretical set weight	send command 2102 to CMDR; read the value in R1
Starting tare	send command 2103 to CMDR; read the value in R1 and the sign of the value (0 = positive; 1 = negative)
Alarm	send command 2105 to CMDR; read the index in R1 (32-bit value, each byte corresponds to an alarm occurring during the batching; the first alarm occupies the least significant byte)

Index	Alarm	Description
0		no alarm
1		generic alarm
2	**EMPTY**	empty formula
3	**MASFOR**	the quantity set in formula is greater than the maximum weight
4	**TARE?**	the weight is greater than the minimum weight set
7	**TOL**	out of tolerance
8	**LOAD**	the product is not being loaded
9	**UNLOAD**	the product is not being unloaded
12		batching STOP
13	**ERWEIG**	weight error
14	**FALL**	the fall is greater than the quantity to be batched
15	**SLAVE**	waits for the confirmation of data reading from PC

10.7 Consumption management

If consumption is enabled, the batched quantities for each formula are stored. It is possible to read the total quantity consumed for all formulas (divided by 100) and the quantity consumed for each formula.

- Reading: write the formula number in W2 and send command 2020 to CMDR; read the consumption of the formula in R1.
- Deletion: write the formula number in W2 (0 = all formulas) and send command 1135 to CMDR.

11 Fieldbuses

Important The configuration and use of the fieldbuses are only possible when power is supplied to the SERVICE connector. The fieldbus configuration is done via the configuration software.

The device description files named below (eds, xml, xdd, gsdml, csp, sddml) are supplied with the instrument. Status LEDs: chapter 6.

11.1 Modbus RTU (RS485 + analogue version)

Instrument setup

Parameter	Range / default	Function
Protocol	NONE (default), MODBUS, ASCII, CONTIN, RIP, HDRIP, HDRIPN	NONE disables any communication; MODBUS = Modbus RTU; the other protocols: chapter 12
Baud rate	2400, 4800, 9600, 19200, 38400, 115200; default 9600	transmission speed
Address	1 ... 99; default 1	instrument address
Delay	0 ... 200 ms; default 0	delay before the instrument replies
Parity	NONE (default), EVEN, ODD	parity bit
Stop	1 ... 2; default 1	stop bits

PC/PLC setup

The Modbus RTU protocol allows reading and writing of the data in the following table according to the reference document Modicon PI-MBUS-300. Check whether the Modbus RTU master (or the development tool) requires the register numbering based on 40001 or on 0. In the first case the numbering corresponds to the table; in the second case the register is the value in the table minus 40001. Example: register 40018 is addressed as 17.

Output data (reading)	Address	Input data (writing)	Address
Gross weight (H – L)	40008-40009	Command register	40006
Net weight (H – L)	40010-40011	Digital outputs command	40018
Exchange register R1 (H – L)	40051-40052	Exchange register W1 (H – L)	40051-40052
Exchange register R2	40053	Exchange register W2	40053
Status register 1	40007		
Status register 2	40148		
Instrument status	40179		
Execution register	40147		
Digital inputs status	40017		
Digital outputs status	40018		

Data format: 1 start bit; 8 data bits, least significant bit sent first; settable parity bit; settable stop bit.

Functions supported

Only the following functions are used; other commands could be incorrectly interpreted and generate errors or blocks of the system:

Function	Description
03 (0x03)	READ HOLDING REGISTER (read programmable registers)
16 (0x10)	PRESET MULTIPLE REGISTERS (write multiple registers)

The interrogation frequency depends on the communication speed set (the instrument stands by for at least 3 bytes before starting to calculate a response). The delay parameter lets the instrument respond with a further delay and directly influences the number of interrogations possible per unit of time.

Frame	Structure	Total bytes
Function 3 – query	address A · function 0x03 · 1st register address (e.g. 0x0000) · no. of registers (e.g. 0x0002) · CRC (2 byte)	8
Function 3 – response	address A · function 0x03 · no. of bytes (e.g. 0x04) · 1st register (e.g. 0x0064) · 2nd register (e.g. 0x00C8) · CRC (2 byte)	3 + 2 × no. of registers + 2
Function 16 – query	address A · function 0x10 · 1st register address · no. of registers · no. of bytes · value of register 1 · value of register 2 · CRC (2 byte)	7 + 2 × no. of registers + 2
Function 16 – response	address A · function 0x10 · 1st register address · no. of registers modified · CRC (2 byte)	8

Communication error management

The communication strings are checked by CRC (cyclical redundancy check). In case of a communication error the slave does not respond; the master must consider a time-out for the answer and, if none arrives, deduce a communication error. If the string is received correctly but cannot be executed, the slave sends an exceptional response: address A · function + 0x80 · code · CRC (2 byte).

Code	Description
1	ILLEGAL FUNCTION (the function is not valid or is not supported)
2	ILLEGAL DATA ADDRESS (the specified data address is not available)
3	ILLEGAL DATA VALUE (the data received has an invalid value)

Communication examples (hexadecimal, prefix h)

Example 1 – multiple writing of registers (function 16): write 0 to register 40051 and 2000 to register 40052. Query: **`h01 h10 h00 h32 h00 h02 h04 h00 h00 h07 hD0 h72 hCE`**. Response: **`h01 h10 h00 h32 h00 h02 hE0 h07`**.

Example 2 – multiple reading of registers (function 3): read gross weight (e.g. 4000) and net weight (e.g. 3000) from address 40008 to 40011. Query: **`h01 h03 h00 h07 h00 h04 hF5 hC8`**. Response: **`h01 h03 h08 h00 h00 h0F hA0 h00 h00 h0B hB8 h12 h73`**.

11.2 CANopen (CANopen version)

Parameter	Range / default	Function
Address	default 1	instrument address (node ID) in the CANopen network
Baud rate	default 10 kb/s	baud rate in the CANopen network
Swap	default disabled	byte order: enabled = big endian, disabled = little endian
Output rate	5 ... 250 Hz; default 10 Hz	data refresh frequency on the network

The instrument works as slave in a CANopen network and features a dual port to exchange the weight and the main parameters with a CANopen master. Load the eds file to the development system and configure the device.

Output data (reading)	Address	Input data (writing)	Address
Gross weight	0x0000-0x0003	Command register	0x0000-0x0001
Net weight	0x0004-0x0007	Digital outputs command	0x0002-0x0003
Exchange register R1	0x0008-0x000B	Exchange register W1	0x0004-0x0007
Exchange register R2	0x000C-0x000D	Exchange register W2	0x0008-0x0009
Status register 1	0x000E-0x000F		
Status register 2	0x0010		
Instrument status	0x0011		
Execution register	0x0012-0x0013		
Digital inputs status	0x0014		
Digital outputs status	0x0015		

11.3 IO-Link (IO-Link version)

The instrument works as device in an IO-Link network and exchanges the weight and the main parameters with an IO-Link gateway. Use only one communication interface connector (section 5.4.3).

Parameter	Range / default	Function
Output rate	10 Hz	data refresh frequency on the IO-Link network

Output data (reading)	Address	Input data (writing)	Address
Gross weight	0x0000-0x0003	Command register	0x0000-0x0001
Net weight	0x0004-0x0007	Digital outputs command	0x0002-0x0003
Exchange register R1	0x0008-0x000B	Exchange register W1	0x0004-0x0007
Exchange register R2	0x000C-0x000D	Exchange register W2	0x0008-0x0009
Status register 1	0x000E-0x000F		
Status register 2	0x0010		
Instrument status	0x0011		
Execution register	0x0012-0x0013		
Digital inputs status	0x0014		
Digital outputs status	0x0015		

– Import the description file of the IO-Link gateway used in the development system.
– Include the IO-Link gateway in the project.
– Configure the gateway and set a size consistent with the number of data exchanged by the instrument for the memory area associated with the IO-Link port to which the instrument is connected.

Note Starting with firmware revision 1.04.05, use the revision 1.1 description file.

The IO-Link gateway used could add additional bytes to those exchanged with the instrument. Example: IO-Link 24/24 byte I/O – 48 bytes, 24 for reading and 24 for writing data, set for the memory area of the gateway port; status/control module – 8 bytes, 4 for reading and 4 for writing data control, added by the gateway.

11.4 EtherCAT (EtherCAT version)

Parameter	Range / default	Function
Output rate	5 ... 500 Hz; default 10 Hz	data refresh frequency on the network

The instrument is a standard EtherCAT slave with a dual port to exchange the weight and the main parameters with an EtherCAT master. The BUS OUT connector of the EtherCAT slave must be connected from the EtherCAT master side. Load the xml file to the development system and configure the device.

Output data (reading)	Address	Input data (writing)	Address
Gross weight	0x0000-0x0003	Command register	0x0000-0x0001
Net weight	0x0004-0x0007	Digital outputs command	0x0002-0x0003
Exchange register R1	0x0008-0x000B	Exchange register W1	0x0004-0x0007
Exchange register R2	0x000C-0x000D	Exchange register W2	0x0008-0x0009
Status register 1	0x000E-0x000F		
Status register 2	0x0010		
Instrument status	0x0011		
Execution register	0x0012-0x0013		
Digital inputs status	0x0014		
Digital outputs status	0x0015		

11.5 EtherNet/IP (EtherNet/IP version)

Parameter	Range / default	Function
Swap	default disabled	byte order: enabled = big endian, disabled = little endian
IP address	default 10.2.0.170	instrument IP address
Subnet mask	default 255.255.255.0	instrument subnet mask
Gateway	default 10.2.0.254	gateway address of the Ethernet network
Output rate	5 ... 500 Hz; default 10 Hz	data refresh frequency on the network

The instrument works as adapter in an EtherNet/IP network with a dual port to exchange the weight and the main parameters with an EtherNet/IP scanner. Use one of the following communication types.

Class 1 connection (implicit messages): either load the eds file to the scanner development system (output data interface: 32-bit run/idle header), or use a generic EtherNet/IP module configured with the parameters below and choose the real-time format from instrument to scanner (target to originator, T2O): 32-bit run/idle header or pure data.

Assembly	Assembly instance	Size [byte] 32-bit run/idle header	Size [byte] pure data
Input	101	22	26
Output	100	10	10
Configuration	128	0	0

Class 3 connection (explicit messages): manually generate the request to the PLC with the following settings (output data interface: pure data).

Field	Read	Write
Service	0x0E	0x10
Class	0x04	0x04
Instance	0x65	0x64
Attribute	0x03	0x03
Data	no	byte array to be written

Output data (reading)	Input assembly: 32-bit run/idle header	Input assembly: pure data
EtherNet/IP header*	–	0x0000-0x0003
Gross weight	0x0000-0x0003	0x0004-0x0007
Net weight	0x0004-0x0007	0x0008-0x000B
Exchange register R1	0x0008-0x000B	0x000C-0x000F
Exchange register R2	0x000C-0x000D	0x0010-0x0011
Status register 1	0x000E-0x000F	0x0012-0x0013
Status register 2	0x0010	0x0014
Instrument status	0x0011	0x0015
Execution register	0x0012-0x0013	0x0016-0x0017
Digital inputs status	0x0014	0x0018
Digital outputs status	0x0015	0x0019

* registers used by the EtherNet/IP scanner to manage the communication.

Input data (writing)	Output assembly
Command register	0x0000-0x0001
Digital outputs command	0x0002-0x0003
Exchange register W1	0x0004-0x0007
Exchange register W2	0x0008-0x0009

11.6 Modbus/TCP (Modbus/TCP version)

Parameter	Range / default	Function
DHCP enable	default enabled	IP address, subnet mask and gateway acquired via DHCP; if YES these parameters are not visible
Swap	default disabled	byte order: enabled = little endian, disabled = big endian
IP address	default 10.2.0.170	instrument IP address
Subnet mask	default 255.255.255.0	instrument subnet mask
Gateway enable	default disabled	if NO, the interface does not use the gateway parameter
Gateway	default 10.2.0.254	gateway address of the Ethernet network
Output rate	5 ... 50 Hz; default 10 Hz	data refresh frequency on the network

The instrument works as slave in a Modbus/TCP network with a dual port to exchange the weight and the main parameters with a Modbus/TCP master. Use port 502. Supported function codes: 04 read input registers; 06 preset single register; 16 preset multiple registers.

Output data (reading)	Address	Input data (writing)	Address
Gross weight	0x0000-0x0001	Command register	0x0000
Net weight	0x0002-0x0003	Digital outputs command	0x0001
Exchange register R1	0x0004-0x0005	Exchange register W1	0x0002-0x0003
Exchange register R2	0x0006	Exchange register W2	0x0004
Status register 1	0x0007		
Status register 2 (H) + instrument status (L)	0x0008		
Execution register	0x0009		
Digital inputs status (H) + digital outputs status (L)	on request		

11.7 POWERLINK (POWERLINK version)

Parameter	Range / default	Function
Address	default 1	instrument address
Output rate	5 ... 100 Hz; default 10 Hz	data refresh frequency on the network

The instrument works as slave in a POWERLINK network with a dual port to exchange the weight and the main parameters with a POWERLINK controller. Load the xdd file to the development system and configure the device.

Output data (reading)	Address	Input data (writing)	Address
Gross weight	0x0000-0x0003	Command register	0x0000-0x0001
Net weight	0x0004-0x0007	Digital outputs command	0x0002-0x0003
Exchange register R1	0x0008-0x000B	Exchange register W1	0x0004-0x0007
Exchange register R2	0x000C-0x000D	Exchange register W2	0x0008-0x0009
Status register 1	0x000E-0x000F		
Status register 2	0x0010		
Instrument status	0x0011		
Execution register	0x0012-0x0013		
Digital inputs status	0x0014		
Digital outputs status	0x0015		

11.8 PROFINET IO (PROFINET IO version)

Parameter	Range / default	Function
Swap	default disabled	byte order: enabled = little endian, disabled = big endian
Output rate	5 ... 500 Hz; default 10 Hz	data refresh frequency on the network

The instrument works as device in a PROFINET IO network with a dual port to exchange the weight and the main parameters with a PROFINET IO controller, and supports the MRP client functionality. Load the gsdml file to the development system and configure the device. Assign a name to the device (function Assign Device Name) using letters (a-z), numbers (0-9) and the minus character (-), and set at least 1 ms as I/O refresh time.

Output data (reading)	Address	Input data (writing)	Address
Gross weight	0x0000-0x0003	Command register	0x0000-0x0001
Net weight	0x0004-0x0007	Digital outputs command	0x0002-0x0003
Exchange register R1	0x0008-0x000B	Exchange register W1	0x0004-0x0007
Exchange register R2	0x000C-0x000D	Exchange register W2	0x0008-0x0009
Status register 1	0x000E-0x000F		
Status register 2	0x0010		
Instrument status	0x0011		
Execution register	0x0012-0x0013		
Digital inputs status	0x0014		
Digital outputs status	0x0015		

Module sizes: output data from gross weight to execution register = 20 byte output, digital inputs and outputs status = 2 byte output; input data command register = 2 byte input, digital outputs command with W1 and W2 = 8 byte input.

11.9 CC-Link IE Field Basic (CC-Link IE Field Basic version)

Parameter	Range / default	Function
IP address	default 192.168.0.1	instrument IP address
Subnet mask	default 255.255.255.0	instrument subnet mask
Gateway	default 192.168.0.254	gateway address of the Ethernet network
Output rate	5 ... 50 Hz; default 10 Hz	data refresh frequency on the network

The instrument works as slave in a CC-Link IE Field Basic network, occupies 1 station and has a dual port to exchange the weight and the main parameters with a CC-Link IE Field Basic master. Load the csp file to the master. Data are divided into registers managed by bit (RX/RY) and by word (RWr/RWw). Bits not listed are not used.

RX – output data (reading)	Bit
correct operation of the instrument	RXn6
decimal point 1	RXn8
decimal point 2	RXn9
decimal point 4	RXnA
gross weight negative sign	RXnB
net weight negative sign	RXnC
weight within ±1/4 of a division around ZERO	RX(n+1)0
SET contact	RX(n+1)1
PRESET contact	RX(n+1)2
tapping function	RX(n+1)3
tolerance	RX(n+1)4
weight stability	RX(n+1)7
cycle end	RX(n+1)8
maximum gross weight exceeded by 9 divisions	RX(n+1)9
net indication	RX(n+2)0
load cells references not connected	RX(n+2)1
AD converter malfunction	RX(n+2)2
load cell error	RX(n+2)3
net weight over the maximum displayable value	RX(n+2)4
gross weight over the maximum displayable value	RX(n+2)5
system ready	RX(n+3)B

RY – input data (writing)	Bit
semi-automatic zero	RY(n+1)0
semi-automatic tare enabling (net indication)	RY(n+1)2
semi-automatic tare disabling (gross indication)	RY(n+1)3
batching start	RY(n+1)7
batching pause	RY(n+1)8
batching resume	RY(n+1)9
batching stop	RY(n+1)A
accept batching alarm	RY(n+1)B
ignores **TARE?**	RY(n+1)C
ignores **TOL**	RY(n+1)D

RWr – output data (reading)	Abbreviation	Size (byte)	Address
Gross weight	GW	4	Wr0000-Wr0001
Net weight	NW	4	Wr0002-Wr0003
Exchange register R1	R1	4	Wr0004-Wr0005
Exchange register R2	R2	2	Wr0006
–		2	Wr0007
Status register 1	SR1	2	Wr0008
Status register 2 + instrument status*	SR2 + IS	2	on request
Execution register	EXR	2	Wr000A
Digital inputs status + digital outputs status**	INS + OUTS	2	Wr000B

* status register 2 in the most significant part, instrument status in the least significant part. ** digital inputs status in the most significant part, digital outputs status in the least significant part.

RWw – input data (writing)	Abbreviation	Size (byte)	Address
Command register	CMDR	2	Ww0000
Digital outputs command	CMDOUT	2	Ww0001
Exchange register W1	W1	4	Ww0002-Ww0003
Exchange register W2	W2	2	Ww0004

11.10 SERCOS III (SERCOS III version)

Parameter	Range / default	Function
Address	default 1	instrument address
Output rate	5 ... 100 Hz; default 10 Hz	data refresh frequency on the network

The instrument works as slave in a SERCOS III network with a dual port to exchange the weight and the main parameters with a SERCOS III master. Load the sddml file to the development system and configure the device.

Output data (reading)	Address	Input data (writing)	Address
AT connection control*	0x0000-0x0001	MDT connection control*	0x0000-0x0001
AT IO status*	0x0002-0x0003	MDT IO control*	0x0002-0x0003
Gross weight	0x0004-0x0007	Command register	0x0004-0x0005
Net weight	0x0008-0x000B	Digital outputs command	0x0006-0x0007
Exchange register R1	0x000C-0x000F	Exchange register W1	0x0008-0x000B
Exchange register R2	0x0010-0x0011	Exchange register W2	0x000C-0x000D
Status register 1	0x0012-0x0013		
Status register 2	0x0014		
Instrument status	0x0015		
Execution register	0x0016-0x0017		
Digital inputs status	0x0018		
Digital outputs status	0x0019		

* registers used by the SERCOS III master to manage the communication.

12 Serial protocols (RS485 + analogue version)

Important The configuration and use of the serial protocols are only possible when power is supplied to the SERVICE connector. The configuration is done via the configuration software.

12.1 Serial communication setting

Parameter	Range / default	Function
Protocol	NONE (default)	disables any communication
	MODBUS	Modbus RTU protocol (section 11.1)
	ASCII – modes MODEW60/MODE T or MODE TD	ASCII bidirectional protocol; addresses 1 ... 99
	CONTIN (10 ... 300) – modes MODE T or MODE TD (set parity NONE, stop bit 1)	fast continuous weight transmission at the frequency set in HERTZ
	RIP, HDRIP, HDRIPN (set baud rate 9600, parity NONE, stop bit 1)	continuous weight transmission to remote displays
Baud rate	2400, 4800, 9600, 19200, 38400, 115200; default 9600	transmission speed
Address	1 ... 99; default 1	instrument address
Hertz	10, 20, 30, 40, 50, 60, 70, 80, 100, 200, 300; default 10	maximum transmission frequency with the CONTIN protocol
Delay	0 ... 200 ms; default 0	delay before the instrument replies
Parity	NONE (default), EVEN, ODD	parity bit
Stop bit	1 ... 2; default 1	stop bits

Maximum HERTZ setting: 20 Hz with minimum 2400 baud; 40 Hz with minimum 4800 baud; 80 Hz with minimum 9600 baud; 100 Hz with minimum 19200 baud; 200 Hz and 300 Hz with minimum 38400 baud.

When the remote display is set to gross weight: if the instrument indicates the gross weight, the remote display shows the gross weight; if the instrument indicates the net weight, the remote display shows the net weight alternated with the message **NET**. Compatible remote displays and instruments: on request from octogon.

12.2 Fast continuous transmission protocol

Continuous transmission of the weight at high update frequencies: up to 300 strings per second with a minimum transmission rate of 38400 baud. Modes: MODE T or MODE TD.

MODE T – string transmitted to PC/PLC: **xxxxxxCRLF**, where xxxxxx = 6 characters of gross weight (48 ... 57 ASCII), CR = carriage return (13 ASCII), LF = line feed (10 ASCII).

MODE TD – string transmitted to PC/PLC: **&TzzzzzzPzzzzzz\ckckCR**, where & = initial character (38 ASCII); T and P = gross weight identification characters; zzzzzz = 6 characters of gross weight (48 ... 57 ASCII); \ = separator (92 ASCII); ckck = 2 ASCII control characters calculated on the characters between "&" and "\" excluded, by XOR of their 8-bit ASCII codes, expressed as two hexadecimal digits ("0" ... "9", "A" ... "F"); CR = end of string (13 ASCII).

- In case of negative weight, the first character from the left takes the value "–" (minus sign, ASCII 45).
- In case of error or alarm, the 6 weight characters are replaced by the messages in section 13.3.
- Fast transmission via external contact (BASE program): the weight can be transmitted once by closing an input set to CONTIN for no more than a second (section 9.6).

12.3 Continuous weight transmission to remote displays

The string is transmitted 10 times per second. Modes: RIP and HDRIP – the remote display shows the net or gross weight according to its settings; HDRIPN. Setting for all three modes: baud rate 9600, parity NONE, stop bit 1 (section 12.1). The instrument sends: **&NxxxxxxLyyyyyy\ckckCR**, where & = initial character (38 ASCII); N = net weight identification (78 ASCII); xxxxxx = 6 characters of net weight or PEAK if present (48 ... 57 ASCII); L = gross weight identification (76 ASCII); yyyyyy = 6 characters of gross weight; \ = separator (92 ASCII); ckck = checksum as in section 12.2; CR = end of string (13 ASCII).

- Negative weight: the first character from the left takes the value "–" (ASCII 45).

– HDRIP: the decimal point can also be transmitted; if the value exceeds 5 digits only the 5 most significant digits are transmitted, if negative no more than the 4 most significant digits; the decimal point moves consistently.

– HDRIPN: in addition, the instrument transmits **NET** every 4 seconds in the gross weight field if a net operation has been carried out (section 9.8).

– Weight below –99999: the minus sign is sent alternated with the most significant figure.

– Error or alarm: the 6 characters of gross and net weight are replaced by the messages in section 13.3.

12.4 ASCII bidirectional protocol

The instrument replies to requests from a PC/PLC with an ASCII string; a waiting time before the response can be set (delay). Modes: MODEW60/MODE T or MODE TD.

Character	Meaning
$	beginning of a request string (36 ASCII)
& or **&&**	beginning of a response string (38 ASCII)
aa	2 characters of instrument address (48 … 57 ASCII)
!	correct reception (33 ASCII)
?	reception error (63 ASCII)
#	error in the command execution (23 ASCII)
ckck	2 ASCII check-sum characters (section 12.5)
CR	end of string (13 ASCII)
****	separator (92 ASCII)

Function	PC transmits	Instrument response
Setpoint programming (active immediately); xxxxxx = 6 characters of the value; y = A, B, C for setpoint 1, 2, 3	**$aaxxxxxxyckckCR**	correct: **&&aa!\ckckCR**; incorrect: **&&aa?\ckckCR**
Setpoint storage in EEPROM (setpoints are otherwise lost at power-off; about 100000 writings allowed)	**$aaMEMckckCR**	correct: **&&aa!\ckckCR**; incorrect: **&&aa?\ckckCR**
Reading weight, setpoint, peak; j = a, b, c setpoint 1 … 3; t gross weight; n net weight; p gross weight peak (mode MODEW60) or gross weight (mode MODE TD)	**$aajckckCR**	correct: **&aaxxxxxxj\ckckCR**; incorrect: **&&aa?\ckckCR**; peak not configured: **&aa#CR**
Semi-automatic zero	**$aaZEROckckCR**	correct: **&&aa!\ckckCR**; incorrect: **&&aa?\ckckCR**; weight over the maximum resettable value: **&aa#CR**
Switching from gross to net weight	**$aaNETckckCR**	correct: **&&aa!\ckckCR**; incorrect: **&&aa?\ckckCR**
Switching from net to gross weight	**$aaGROSSckckCR**	correct: **&&aa!\ckckCR**; incorrect: **&&aa?\ckckCR**
Reading of decimals and division; x = number of decimals; y = 3 … 9 for division 1, 2, 5, 10, 20, 50, 100	**$aaDckckCR**	correct: **&aaxy\ckckCR**; incorrect: **&&aa?\ckckCR**
Tare zero-setting; z = command (122 ASCII); t = weight identification (116 ASCII)	**$aazckckCR**	correct: **&aaxxxxxxt\ckckCR**; incorrect: **&&aa?\ckckCR**; instrument not indicating the gross weight: **&aa#CR**
Real calibration with sample weight; s = calibration command (115 ASCII); xxxxxx = sample weight	**$aasxxxxxxckckCR**	correct: **&aaxxxxxxt\ckckCR** (current weight); incorrect or full scale equal to zero: **&&aa?\ckckCR**

– Example setpoint: to set 500 in setpoint no. 3 the PC transmits **$01000500C47(Cr)**.

– Reading: to read the points, set the theoretical full scale equal to 50000. Negative weight: the first character from the left takes the value "–"; below –99999 the minus sign is sent alternated with the most significant figure.

– Error messages: exceeding 110 % of the full scale or 9 divisions above the maximum weight – **&aassO-Lst\ckck**; faulty load cell connection or another alarm – **&aassO-Fst\ckck** (s = space, 32 ASCII). See also section 13.3.

– Tare zero-setting – make sure the system is unloaded or the instrument measures the mV signal of that condition. Example, instrument address 2: query **$02z78(Cr)**, response **&02000000t\76(Cr)**; if correct, the zeroed weight "000000" is sent.

– Real calibration – after the tare zero-setting, load a sample weight of at least 50 % of the full scale (or make the instrument measure the corresponding mV signal). Example, instrument no. 1 with 20000 kg: query **$01s02000070(Cr)**, response **&01020000t\77(Cr)**; the read value must be "020000".

– The calibration values are stored permanently in the EEPROM; the number of allowed writings is limited (about 100000).

12.5 Check-sum calculation

The two ASCII characters ckck represent a hexadecimal value. It is calculated as XOR (exclusive OR) of the 8-bit ASCII codes of the characters of the string concerned. The result in hexadecimal notation consists of 2 digits (0 ... 9, A ... F); the checksum is made up of the 2 characters that represent these digits.

Character	Decimal ASCII code	Hexadecimal ASCII code	Binary ASCII code
0	48	30	00110000
1	49	31	00110001
t	116	74	01110100
XOR =	117	75	01110101

In this example the hexadecimal code is 0x75; the checksum consists of the characters "7" and "5".

13 Alarms

13.1 Alarm list

The Alarm column gives the name of the error condition, the Protocol column the corresponding message via the communication interface (chapter 7).

Alarm	Protocol	Description
`------`	SR1 bit 2	The weight exceeds the maximum weight by 9 divisions.
`COMAND`	IS = 3	Waiting for START closure to continue the batching.
`EMPTY`	IS = 14	Activated if, at batching start, the formula recalled for running is not programmed.
`ER AD`	SR1 bit 1	Instrument internal converter failure; check load cell connections, if necessary contact octogon.
`ER OF`	SR1 bit 4 ... 5	The maximum displayable value has been exceeded (value higher than 999999 or lower than –999999).
`ER OL`	SR1 bit 3	The weight exceeds 110 % of the full scale.
`ERCEL`	SR1 bit 0	The load cell is not connected or is incorrectly connected; the load cell signal exceeds 26 mV; the conversion electronics (AD converter) is malfunctioning.
`ERWEIG`	IS = 10	Activated when there is a weight alarm; it cancels the current batching.
`FALL`	IS = 7	Activated if at batching start the fall value is higher than the product quantity to be batched.
`LOAD`	IS = 18	During the batching it indicates that the product is not loaded. It is automatically cancelled if the product increases.
`MASFOR`	IS = 15	Activated if, at batching start, the formula recalled for running exceeds the maximum weight.
`PARSER`	IS = 19	The batching is cancelled. If the alarm persists, contact octogon.
`PAUSE`	IS = 5	The batching is paused.
`SLAVE`	IS = 13	The batching data were not read remotely.
`TARE?`	IS = 17	Activated if, at batching start, the weight on the scale is higher than the minimum weight set in the constants. If the weight comes back below the minimum, the batching starts.
`TOL`	IS = 8	Activated if at batching end the weight differs from the value set in the formula by more than the tolerance.
`UNLOAD`	IS = 6	Activated during the unload (cycle end contact closed) when the product is not extracted. It is automatically cancelled if the product decreases.

13.2 Outputs in case of alarm

With an alarm the relays open and the analogue outputs go to the lowest possible value:

Range	0 ... 20 mA	4 ... 20 mA	0 ... 5 V	0 ... 10 V
Output value	0 mA	3.5 mA	0 V	0 V

13.3 Serial protocol alarms

Messages sent instead of the weight characters ("_" stands for a space):

Mode	ERCEL	ER OL	ER AD	-----	ER OF
ASCII	__0-F_	__0-L_	__0-F_	__0-L_	__0-F_
RIP	__0-F_	__0-L_	__0-F_	__0-L_	__0-F_
HDRIP-N	_ERCEL	_ER_0L	_ER_AD	######	_ER_0F
CONTIN	_ERCEL	_ER_0L	_ER_AD	^^^^^^	_ER_0F

13.4 Troubleshooting

– No weight increase when loading the load cells: check the connections and the correct positioning of the load cells (section 8.2), and test the load cells (section 2.5).

– Fieldbus or serial protocol not working: power must be supplied to the SERVICE connector (chapters 11 and 12); check the status LEDs (chapter 6).

– For any other problem, or if an alarm persists, please contact octogon.

14 Directives and standards

According to the manufacturer's declarations of conformity (EU and United Kingdom, 02/09/2025), which cover all interface versions of this manual and are available from octogon on request:

Mark applied	Legislation	Standards
CE	2014/35/EU Low Voltage Directive	Not applicable (N/A) for VDC type
		EN 61010-1:2010+A1:2019 for 230/115 VAC type
CE	2014/30/EU EMC Directive	EN 55011:2016+A1+A11:2020
		EN 61000-6-2:2019
		EN 61000-6-4:2019
		EN 61000-4-2:2009
		EN 61000-4-3:2006+A2:2010
		EN 61000-4-4:2012
		EN 61000-4-5:2014+A1:2017
		EN 61000-4-6:2014
CE M (only if "M" mark is applied)	2014/31/EU NAWI Directive	EN 45501:2015
		OIML R76-1:2006
UKCA	Electrical Equipment (Safety) Regulations 2016	Not applicable (N/A) for VDC type
		BS EN 61010-1:2010+A1:2019 for 230/115 VAC type
UKCA	Electromagnetic Compatibility Regulations 2016	BS EN 55011:2016+A1+A11:2020
		BS EN 61000-6-2:2019
		BS EN 61000-6-4:2019
		BS EN 61000-4-2:2009
		BS EN 61000-4-3:2006+A2:2010
		BS EN 61000-4-4:2012
		BS EN 61000-4-5:2014+A1:2017
		BS EN 61000-4-6:2014
UKCA M (only if "M" mark is applied)	Non-automatic Weighing Instruments Regulations 2016	BS EN 45501:2015