TSX Premium

Weighing module TSX ISPY100

User guide

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1.1 Introduction of the weighing range

The Modicon TSX Premium range of weighing devices consists of :
• a specialized module, TSX ISP Y100,
• a TSX XBT H100 weighing protocol display unit,
• process control applications : weigher dosers, multi-product batching, flow rate controllers, weigher sorters, discontinuous and continuous totalizers,
• load cells,
• junction boxes.

This document only covers module setup and operation : other points are dealt with in the documentation for associated products.
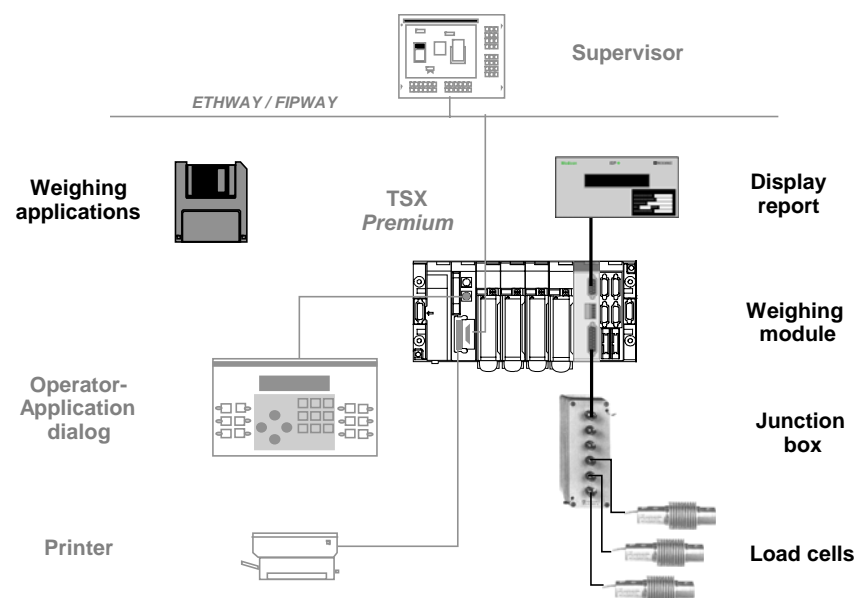
The diagram above shows the various elements which may be used to create a complete weighing configuration.

1.2 Presentation of the weighing module

1.2.1 General

The TSX ISP Y100 has an **measurement input** channel connected to one or more load cells which provide a numerical value corresponding to the weight being measured. A maximum of 8 load cells may be connected to the measurement input which has a resolution of 20 bits (1 048 576 points).
The module executes 50 measurements per second.

The module also has **2 high speed discrete outputs** with constant response times, which trigger actions when thresholds are exceeded.
This type of operation is used for "weigher doser" applications.

A **sealable digital link** enables the weight to be displayed on an external TSX XBT H100 type display unit.

The weighing module occupies a slot in the PLC rack.

The weighing module is an intelligent module : 2 intelligent modules may be installed on the TSX57-10 and 6 on the TSX57-20. You are strongly advised to use weighing modules in the FAST task.

To ensure that measurements are accurate, the measurement input, weighing module and display unit may all be sealed in order to meet any legal requirements relating to weighing instruments for use in commercial transactions.

The module offers functions specific to weighing, such as :

• calibration,
• zero reset,
• semi-automatic tare,
• zero tracking function,
• temporary measurement freeze.

The module communicates with the processor and provides various data relating to weighing, such as :

• weight measurement (gross or net),
• flow rate,
• data on stability, zero, underload, overload, manual tare, etc,
• discrete output image bits,
• the tare value,
• the offset memory value,
• status words : operating report for module and internal or external faults.

The PLC language is used to manage :

• module operation (via the configuration),
• reading measurements,
• module operating modes,
• start processing commands (calibration, tare, zero reset, control of discrete outputs, freezing display, etc).

1.2.2 Physical description of the weighing module

The TSX ISP Y100 module may be inserted into any slot on the TSX RKY racks.

The module consists of the following elements :
- a plastic box with metal screening to protect the electronic circuitry and provide protection against radiated interference.
- a display unit,
- a 15-pin female Sub-D connector for the load cells,
- a 9-pin female Sub-D connector for the remote display unit (TSX XBT H100),
- a 5-pin screw terminal block to connect the discrete outputs.
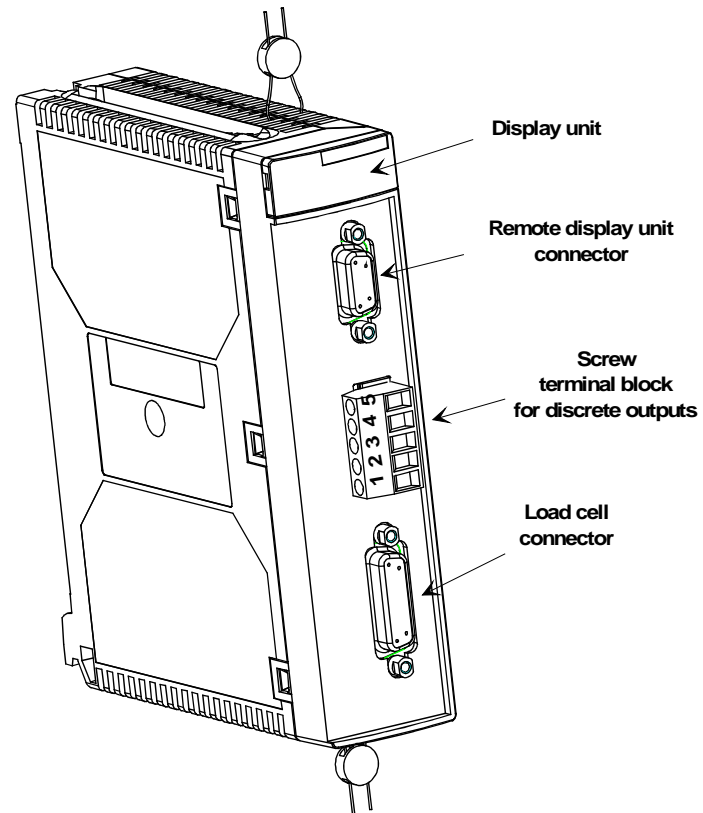
TSX ISP Y100 Weighing Module

1.3 Suggested methodology

To facilitate the development of a control system integrating a weighing function, the flowchart below suggests an installation method and gives section and document references.

```
┌─────────────────────────────────┐
│      Install and connect        │
│  weighing module to the process │
└─────────────────────────────────┘
   Section 2
```

```
                    ┌──────────────────────┐
                    │   Configure module   │
                    │     in PL7 Junior    │
                    └──────────────────────┘
                              Section 3-1
                    ┌──────────────────────┐
                    │     Program the      │
                    │   weighing function  │
                    └──────────────────────┘
                              Section 3-2
```

```
        ┌──────────────────┐
        │    Debug the     │     Section 4
        │ weighing function│
        └──────────────────┘
```

```
        ┌──────────────────┐
        │   Operate the    │     Section 5
        │ weighing function│
        └──────────────────┘
```

```
        ┌──────────────────┐
        │ Protect adjustments │   Section 6
        └──────────────────┘
```
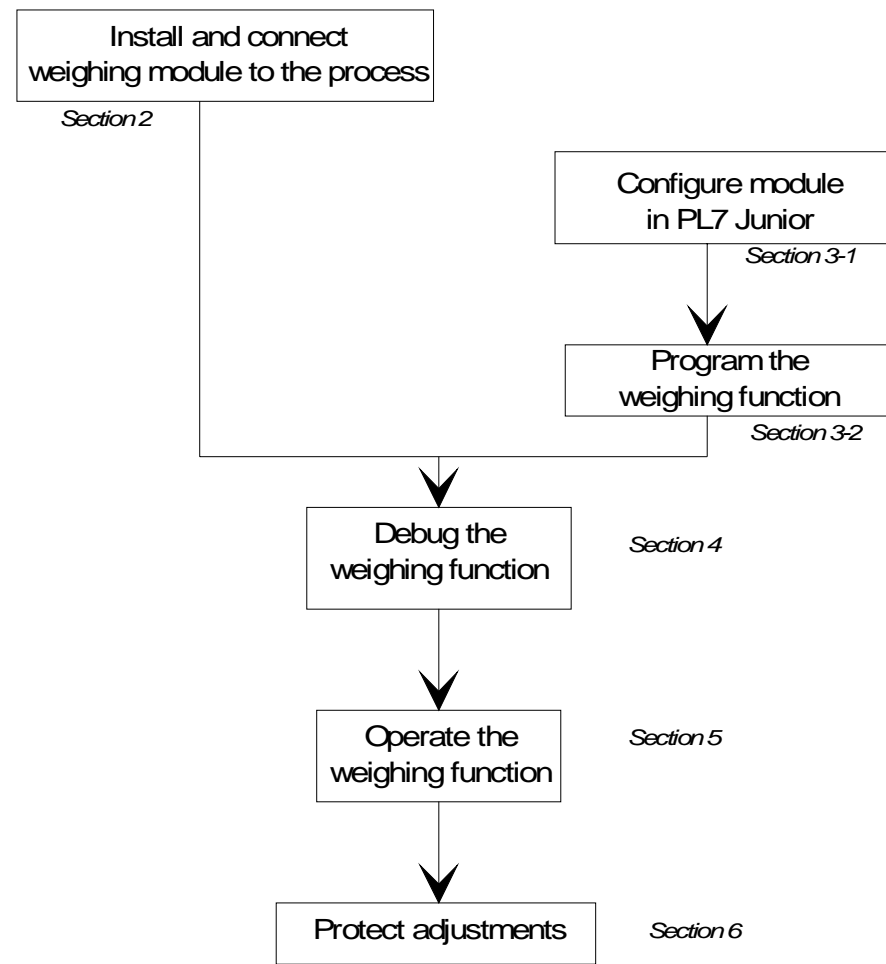
2.1 Installation precautions

The weighing modules and terminal blocks may be mounted or removed while the PLC is powered up with no risk of damaging the module.

2.2 Wiring precautions

To protect the signal from external noise induced in serial mode and from noise occurring in common mode, the following precautions are recommended :

Type of wires
Use shielded twisted pairs.

Cable screening
Measurement cable screening may only be grounded at the module end.
In the event of difficulty, and if the ground connections at both ends are of good quality, both ends of the screening may be grounded.
Connect the cable screening to the Sub-D connector covers : the PLC ground connection is via the Sub-D connector securing pins (it is therefore obligatory to screw the Sub-D connector into its socket).

Cable routing
Route the measurement cables at the maximum possible distance from the discrete I/O cables (especially for relay outputs) and cables carrying "power" signals.
Avoid parallel routing (ensure there is a distance of at least 20 cm between the cables) make sure any intersections are at right angles.

The measurement input is referenced to ground via the module.

2.3 Display of module status

Module operation and status are shown on the display unit :
- two indicator lamps show that the **module** is powered up and operating correctly (a green Run lamp and a red ERR lamp),
- the I/O lamp (red) indicates an external fault on the measurement channel.

Status Lamps	On ●	Flashing ⊗	Off ○
Run	Normal operation.		Module faulty or off.
Err	Internal fault, module faulty.	Communication fault, application absent, invalid or faulty.	No fault.
I/O	External faults : - Overload or underload fault during calibration - Range exceeded fault - Measurement fault - Sealed module (Configuration refused)	Module signalling loss of communication with the CPU.	No fault
CH	No channel status indicator lamp.		

2.4 Description of the connections

2.4.1 Connecting the measurement system

The **module** and the Sub-D connectors may be connected and disconnected while powered up.
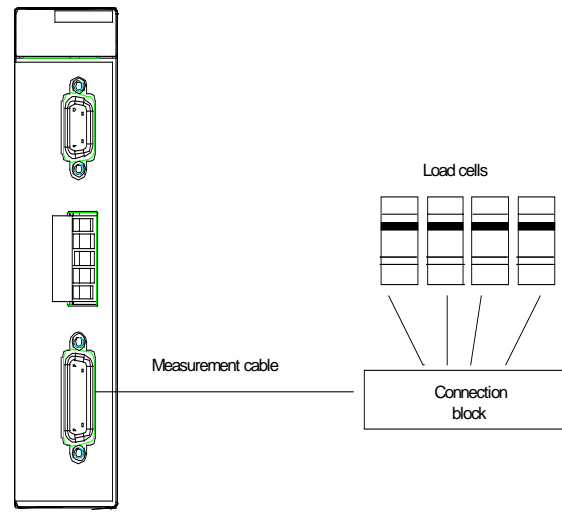
The load cells are connected via a 15-pin female Sub-D connector at the module end. The load cells are powered exclusively by the module. A cable with two shielded twisted pairs should be used.

1 - Measurement input (-)
2 - Load cell input (-)
3 - Load cell input (+)
5 - Measurement input(+)
9 - Power supply output (-)
10 - Power supply output (+)

View from module
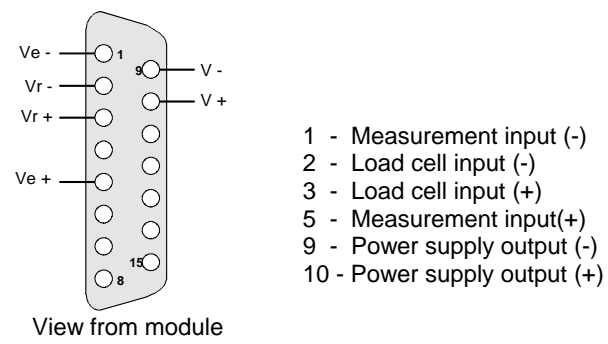
2.4.2 Connecting the discrete outputs

The 24V transistor outputs are connected via a screw terminal as shown below.
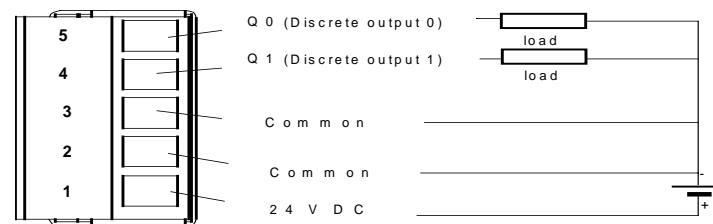
The discrete outputs are electrically isolated from ground.
Commons 2 and 3 are connected via the card.

Discrete transistor outputs	Characteristics
Number of channels	2
Nominal supply voltage	24 V
Maximum current	500 mA
Protection	Polarity inversion and short-circuit

Protection on each channel against short-circuits and overloads
All the channels have an integrated protection device providing protection against these types of faults.

Protection against polarity inversion
The modules are fitted with a device which short-circuits the power supply if the polarity is reversed, without damaging the module.
For this protection to operate in the best possible conditions, a fast-blow fuse should be placed on the power supply upstream of the preactuators.

Note

As a general rule, it is advisable to use one fuse for all the output channels of a module.

2.4.3 Pin-out for the display unit serial link

The serial link enables the weight to be displayed on an external unit.
The terminal is connected via a 9-pin female Sub-D connector at the module end,
RS485 link : connections are as follows :
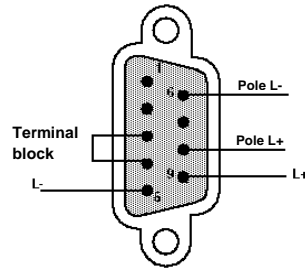
View from module

Straps 6-5 and 8-9 are used to polarize the line at the module end.

2.4.4 The TSX XBT H100 display unit

The TSX XBT H100 is connected to the weighing module, and is the principal
weight indicator display.
The display unit must be connected to the module via a screened 2-wire cable. It
has a 25-pin female Sub-D connector.

Electrical characteristics	
Serial line	RS485, 2 isolated wires
Transmission speed	9600 bauds
Connection	Via sealable Sub-D port
Power supply	3-pin plug-in terminal block from 24 VDC external source
Voltage limits	18 V to 30 V
Ripple	25% maximum
Consumption	10 W
Display unit	Backlit liquid crystal display (2 lines of 20 characters)
Refresh period	Every 100 ms

Note:
For more details refer to the "Magelis Range / user's guide" documentation.
The serial link is isolated at the TSX XBT H100 end.

2.4.5 TSX ISPY100 module power consumption

On the 5 V :
P = 0.75 W typically 150 mH
P = 1.65 W maximum 330 mA.

On the 24 VR :
Power consumption depends on the number of sensors present on the measurement input.
For n sensors :
P = 0.17 W + 0.41 W x n typically (7 mH, 17 mH)
P = 0.34 W + 0.41 W x n maximum (14 mH, 17 mH).

2.4.6 Connecting the display unit

The cable connecting the weighing module to the TSX XBT H100 must not exceed 100 meters.
The screening must be connected to the metal part of the Sub-D connector at the module end Sub-D. A shielded twisted pair may be used.

On weighing module   On TSX XBT H100

View from solder side
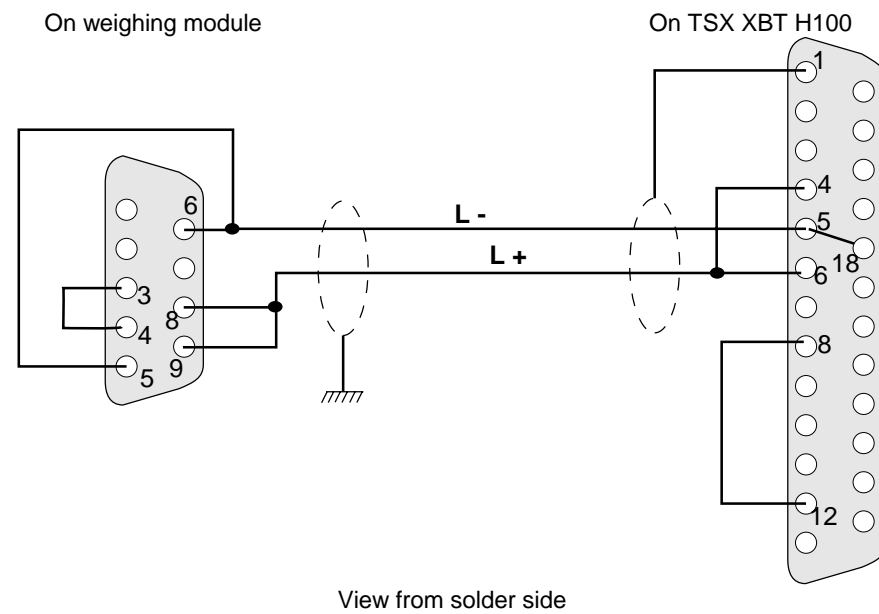
3.1 Module operation

To operate the **weighing module**, it must first be **configured**.
In a PLC environment, the module, like the other modules, has a range of data unique to it. This data is used for exchanges (reports and commands) with the processor.

The following operating diagram shows the processing executed by the module and indicates all the elements which require configuration.
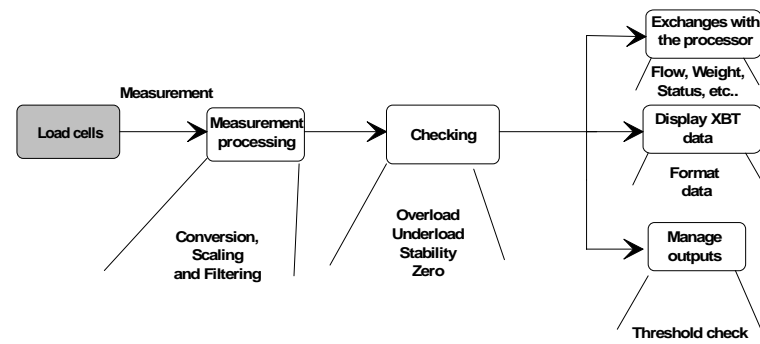
Measurement processing

The signal from the load cells is :
• converted,
• the measurement is filtered in accordance with the selection made on the parameter settings screen,
• scaled, with scale characteristics determined following calibration.

Measurement verification

The measurement resulting from processing is subjected to the following verifications :
• overload check,
• underload check,
• stability check, defined via a stability range and a stability period,
• check for presence of zero in the zone.

Data exchanges with the processor
The module receives and processes the commands from the processor (zero reset, semi-automatic tare, etc).
It also prepares data in "legal" format (ie. as required by law) for display on the TSX XBT H100.
It returns various data to the processor such as gross weight, net weight, flow rate, tare and status.

Data display
The TSX XBT H100 displays the weight or the manual tare in the unit selected during configuration with 4 additional data items : net weight, stability, presence of zero in the zone and the weight unit.

Output management
The module can manage 2 discrete outputs directly and control them according to the thresholds transmitted to the module by the application program.
The elements used in management are :

• the switching thresholds,
• the direction of weight change (Weighing or Downweighing),
• the output switching logic.

3.2 Module configuration

The configuration data is used to define metrological characteristics and adapt the module operation to its intended application.
The weighing module configuration screen appears below (for more information on screen access refer to the PL7 Junior software documentation).

The weighing module has 2 categories of parameters :

- user-defined parameters which are generally modified during setup and then locked,
- operating parameters which are always accessible.

3.2.1 Configuration parameters

The configuration screen contains the following data associated with the weigher and its processing :

Task

The user may choose between :
- Mast task
- Fast task

Note:
For more details, refer to the TLX DS PL7J 10E documentation.

Metrological data

- **Unit :**
  From a predefined list, the user may choose grams, kilograms, tonnes, pounds (1 lb = 453g), ounces (1 oz = 28.35g) or no unit.

- **Maximum range (MR) :**
  This is the maximum load which can be weighed using the instrument, without taking into account the weight of the empty load receptacle (in legal format, see: 'Data format' parameter).

- **Scale division (sd) :**
  The scale division value is in the form 1, 2 or 5 multiplied by 10^n (n being a positive or negative integer or zero with $|n| \leq 3$).

Note:
In industrial use, if because of the weigher installation environment, a resolution of greater than 3000 points is selected, installation precautions for operation in harsh environments must be taken.
It will not be possible to enter a resolution of greater than 50 000 points on the programming screen. In other words, the following inequality must be observed :
Maximum range (MR) < 50 000 x Scale division.

- **Overload threshold**
  This threshold is the value above which the display unit can no longer display the weight (the overload is indicated by '>' on the display unit).
  It may have the following values : +9 scale divisions or +2% of the maximum range or +5% of the maximum range.

Example :
The maximum range is set at 150 Kg and the scale division at 10 g : depending on user choice the operating limit will be :

Overload threshold	Corresponding limit
9 scale divisions	Max. range + 9 sd or 150.09 Kg
+2%	102% of max. range or 153 Kg
+5%	105% of max. range or 157.5 Kg

Note :
Parameters cannot be set for the overload threshold. It defines the tolerated limit for the indication below zero. It is -2% of the maximum range (underload is then indicated by a line of '<' on the display unit).

Zero

- **Extent of the range :**
  Any offset from zero may be corrected in the measurement if this range is not exceeded.
  It is defined as a % of the maximum range. It may take the following values : ±2%, ±5%.

- **Zero tracking** (optional) : this function is used to compensate slow drifts from zero within the extent of the range (±2% of the maximum range). This option is not recommended for automatic installations.

Note :
A slow drift is distinguished from a genuine weighing operation as follows :
Any weight variation with an amplitude of less than one-half of a scale division where the frequency of repetition is low enough to maintain measurement stability is considered to be a drift.
Any correction made by the function is limited to ±2% of the maximum range of the weigher. Once this limit is exceeded, automatic correction no longer functions.

Data format

The weight value displayed or entered by the user
- either as a physical unit with a fixed decimal point : **legal format**
- or as one-hundredth of a physical unit with a fixed decimal point : **high resolution**

> **Comment :**
> A **physical unit with a fixed decimal point** is an integer expressed as a unit of weight for which a decimal point is required.
> The position of the decimal point is given by the power to the tenth of the scale division.

Example :
Legal format :
The value 3014 signifies 301.4 kg if the scale division is 2.10^{-1}kg.
High resolution format :
The value 301403 signifies 301.403 kg if the scale division is 2.10^{-1}kg.
This unit offers greater precision but is not accepted by the French Metrology Department.

Stability

- **Extent of the range:**
  A weight may not be measured immediately after the load is received because of the inevitable oscillations affecting the mechanical parts.
  The stability range represents the amplitude below which the measurement is considered to be stable.
  It can be set at 2, 3, 4, 6 or 8 quarters of a scale division.

- **Time :**
  The stability time represents the period during which the measurement must remain within the stability range to be considered stable. It can be set at 0.4, 0.5, 0.7 or 1 second.

Load cell power supplies

These parameters determine the load cell power supplied by the module at 10 volts (continuous or switched current).

Note :
A switched power supply has the advantage of canceling out any offset voltages within the measurement system, especially those due to thermocouple effects. This option is not available on version 1 of the module.

Filtering

Filtering is on the measurement input of the load cells.
Two types of filter are available :

• sliding average filters (from 1 to 11) where the measurement is an average of the last n values,
• second order filters (from 12 to 19) referenced by their cut-off frequencies.

The user selects the filter value from the list below :

Value	Type of filtering	Characteristics
0	none	unfiltered
1	sliding average	averaged over last 2 measurements
2	sliding average	averaged over last 3 measurements
3	sliding average	averaged over last 4 measurements
4	sliding average	averaged over last 5 measurements
5	sliding average	averaged over last 8 measurements
6	sliding average	averaged over last 16 measurements
7	sliding average	averaged over last 25 measurements
8	sliding average	averaged over last 32 measurements
9	sliding average	averaged over last 40 measurements
10	sliding average	averaged over last 50 measurements
11	sliding average	averaged over last 64 measurements
12	second order filter	cut-off frequency 15 Hz
13	second order filter	cut-off frequency 10 Hz
14	second order filter	cut-off frequency 8 Hz
15	second order filter	cut-off frequency 6 Hz
16	second order filter	cut-off frequency 4 Hz
17	second order filter	cut-off frequency 2 Hz
18	second order filter	cut-off frequency 1 Hz
19	second order filter	cut-off frequency 0.8 Hz

Flow rate

The user may select the number of measurements (one measurement is performed every 20 milliseconds) to calculate the flow rate.

The flow rate is calculated in accordance with the following formula :

$$\text{Flow rate}_n = (\text{Val}_n - \text{Val}_{n-\beta})$$

This is the difference in weight for a number of configured measurements.

With β being the number of measurements for calculating the flow rate, Val_n the unfiltered weight at instant n and $\text{Val}_{n-\beta}$ the unfiltered weight at instant n-β.

Operation :
At any given moment the flow rate is calculated and is implicitly transmitted to the processor as the weight measurement to be used in correcting thresholds. The flow rate is always calculated in high resolution format. This calculation can be made over 2, 4, 8, 16, 32 or 64 measurements.

The default number of measurements is 4.

Tare

The tare is the weight measurement memorized on the last semi-automatic tare command. However, the user may, if necessary, manually introduce a tare value. This tare value is referred to as "predefined" or " manual" and may be transmitted to the module. It is expressed in legal format (physical unit with a fixed decimal point).

> The tare must of necessity be positive or zero and less than the Maximum Range.

When such a device is used, the "predefined" tare indicator (PT) is set. It is disabled when a Tare order is executed.

Note:
The entry range extends from 0 to 65 535 : if the user requires a larger tare, he must modify the scale division and then enter the tare.

Threshold check (optional)

The threshold check manages the discrete outputs of the module. The High Flow cut-off point is associated with output Q0 : the Low Flow cut-off point is associated with output Q1.

- **Active**
  Discrete output management is operating if this box is checked.
  By default, it is not checked.

- **Direction**
  The direction of detection corresponds to the direction in which thresholds are taken into account, either in **Weighing** (filling) or **Downweighing** (emptying).
  The theory is that of exceeding a greater value when weighing or a lesser value when downweighing.
  Weighing is selected by default.

- **Active outputs phase 1**
  The choice is between Q0 only or Q0 and Q1 simultaneously. By default, the module activates Q0 alone in the first phase.

Active output phase 1 (Q0):
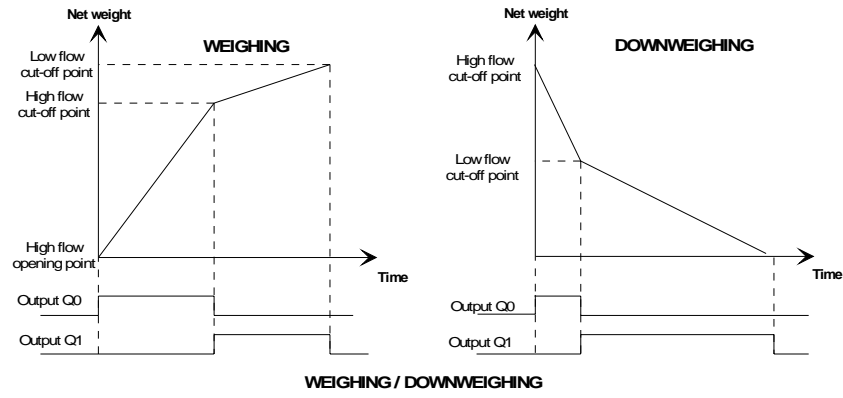
Active output phase 1 (Q0 and Q1):

WEIGHING / DOWNWEIGHING
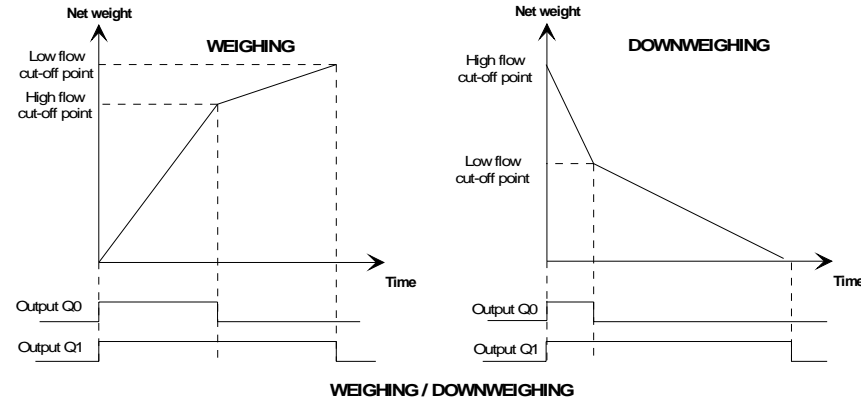
Cut-off points

Measurement may be associated with two thresholds for batching : one High Flow cut-off point and one Low Flow cut-off point. Depending on the logic defined, outputs Q0 and Q1 reset when these thresholds are exceeded.

The permitted threshold values are between 0 and the maximum range. They are expressed in high resolution (one-hundredth of a physical unit with a fixed decimal point).

LF (low flow) mask time

This defines the time after the high flow cut-off point during which the module is no longer checking Weight/Thresholds. This is to mask the overshoot due to the fall of the product. The permitted values are between 0 and 1.5 seconds in steps of $1/10^{th}$ of a second. The default time is zero.
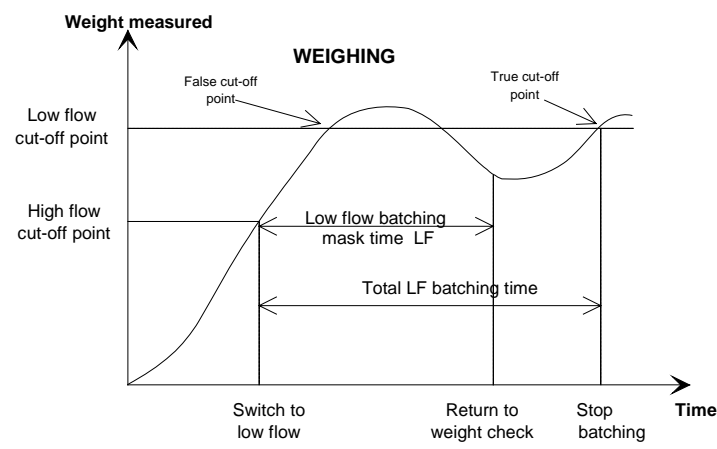
3.2.2 Default configuration

The table below shows the default configuration for the module :

Parameters	Default configuration	Possible	Unit
Task	Mast	Mast Fast	
Data format	Legal format	Legal format High resolution	
Metrology / Unit	kg	kg g t lb oz no unit	kilogram gram tonne pound (= 453g) ounce (= 28.35g)
Metrology / Maximum range	150	from 0 to 65 535	in the unit of weight selected
Metrology / Scale division	$1\ 10^{-2}$	1, 2 or $5\ 10^{n}$	in the unit of weight selected
Metrology / Overload threshold	+9 scale divisions	+9 scale divisions +2% +5%	scale divisions % of Max. Range % of Max. Range
Filtering / Coefficient	4	from 0 to 19	
Flow rate / Calculate on	4	2, 4, 8, 16, 32 or 64	measurements
Tare	Not predefined	Predefined or not	in the unit of weight selected
Stability / Extent of the range	3	2, 3, 4, 6 or 8	1/4 scale division
Stability / Time	1	0.4, 0.5, 0.7 or 1	second
Zero / Zero tracking	Inactive	Inactive or active	
Zero / Extent of the range	±2% MR	±2% MR, ±5% MR	
Cell power supply	DC	Continuous	
Threshold check	Inactive	Inactive or Active	
Output logic	Weighing	Weighing or Downweighing	
Active outputs	Q0	Q0 or (Q0 and Q1)	
Cut-off point	0	from 0 to Max. Range	in 1/100 th of the unit selected
Mask time	0	0 to 1.5 seconds in steps of 0.1 s.	in seconds

3.3 Programming the weighing function

Accessing the weighing function via the control system, as with other modules, is via objects (bits, words, etc, associated with the module).

3.3.1 Language objects associated with the weighing function

The configuration of a weighing module in a given position, generates a set of language objects which can be manipulated via the application program.

The syntax of these objects is structured in the form:

%	I, Q, M, K	X, W, D	xy	•	i	•	r
Sign IEC 1131	**Type of object** I = input Q = output M = internal word K = constant word	**Format** X = boolean W = word D = double word	**Position** x = rack number y = position number in rack		**Channel no.** i = 0 to 127 or **MOD**		**Rank** r = 0 to 255 or **ERR**

The data exchange principle is as follows :
Certain data is exchanged implicitly for each channel on each task scan : others are exchanged explicitly (specific exchange instruction). The model below summarizes the exchanges between the module and the processor:
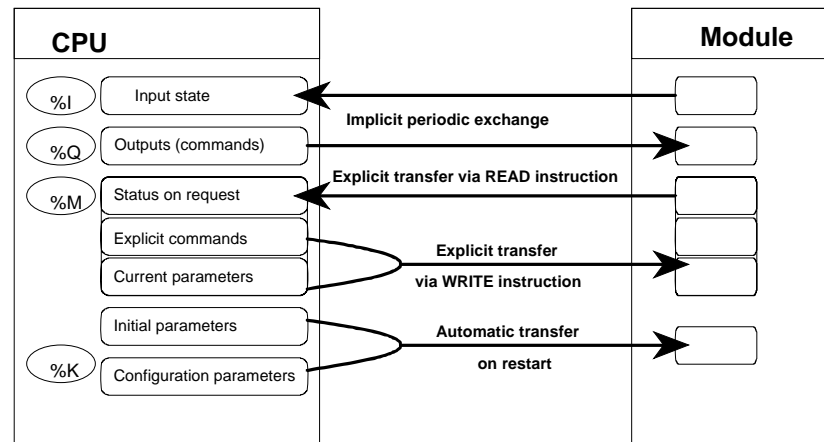
Implicit exchange objects

This data, exchanged at the end of each PLC scan, mainly concerns measurement data. The table below lists the names and significance of this data.

Object address	Object contents
%Ixy.MOD.ERR	Module error bit
%IDxy.0.0	Weight (GROSS or NET)
%IDxy.0.2	Flow rate
%IWxy.0.4	Data on the measured value
%IDxy.0.5	Tare value
%IDxy.0.7	Offset memory (zero offset)
%Ixy.0.ERR	Measurement channel error bit

Explicit exchange objects

This data is updated via command and adjustment functions.

Object address	Object contents
%MWxy.MOD.2	Module status
%CHxy.0	Structure of data attached to the channel
%MWxy.0.0	Exchange in progress
%MWxy.0.1	Exchange report
%MWxy.0.2	Channel status
%MWxy.0.3	Command order (calibration, tare, zero reset, etc)
%MDxy.0.4	Control parameters
%MWxy.0.6	Filtering coefficient
%MWxy.0.7	Manual tare value
%MDxy.0.8	High flow cut-off point Q0 (batching)
%MDxy.0.10	Low flow cut-off point Q1 (batching)
%MWxy.0.12	Logic of outputs Q0 and Q1
%MWxy.0.13	LF mask time
%MWxy.0.14	Number of measurements to calculate flow rate

Constants

Object address	Object contents
%KWxy.0.0	Maximum range (configuration parameter)
%KWxy.0.1	Unit + scale division
%KWxy.0.2	Stability + Zero + Overload + Output use + Format

3.3.2 Programming aspects associated with the weighing function

The flowchart shows the sequencing of the various functions executed by the module.
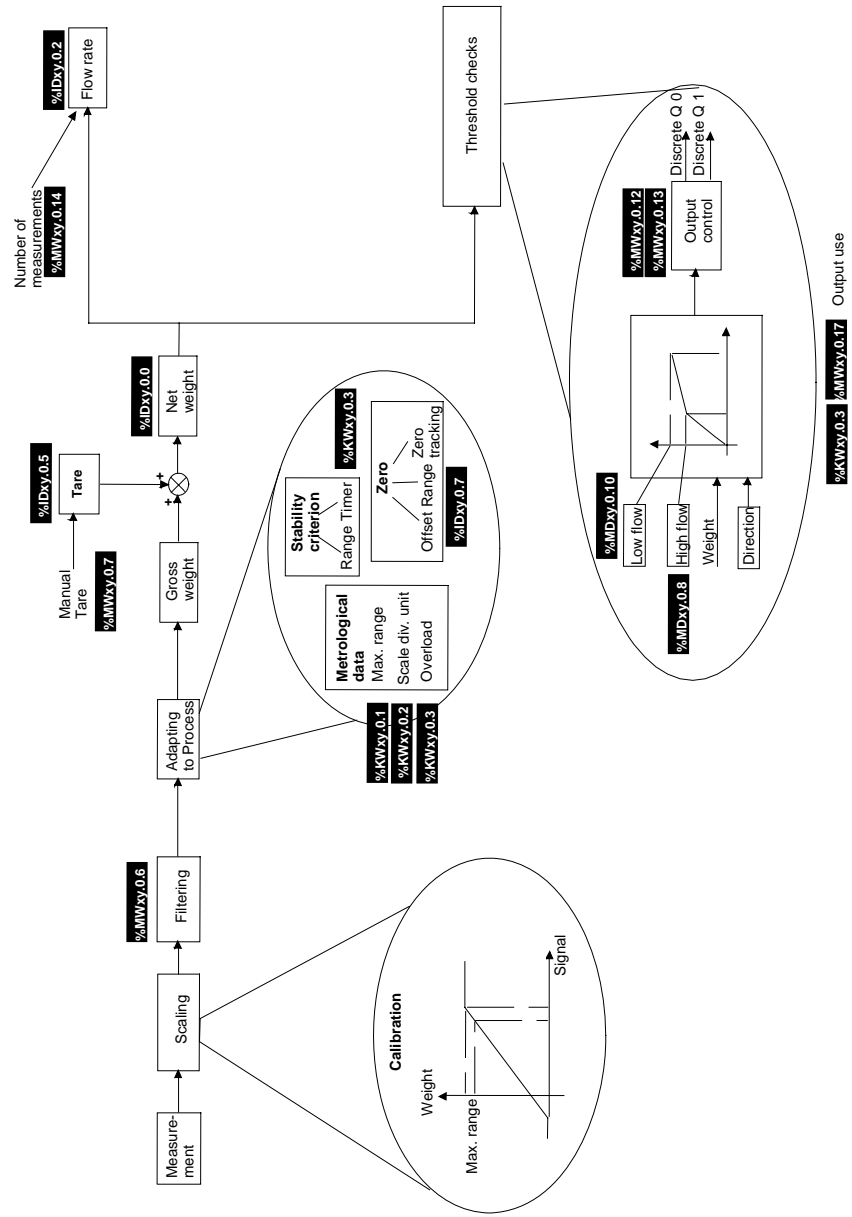
Using the PLC program or directly via the terminal, the user may send commands to the weighing module :
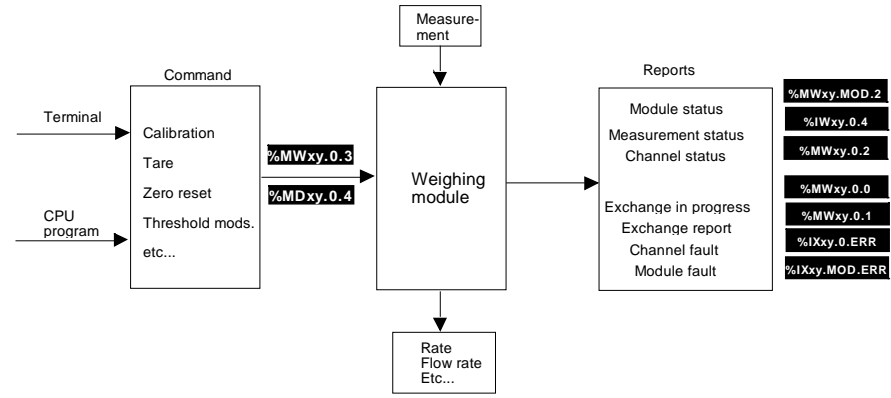
Accessing measurements

The numeric values, weight measurement (GROSS or NET) and flow rate, are placed in **2 double word input registers (%ID)**. They are complemented by 1 measurement status word **(%IW)**, 1 tare value double word **(%ID)** and 1 offset memory double word **(%ID)** (zero offset).

Register address	Register significance
%IDxy.0.0	Weight value (GROSS or NET)
%IDxy.0.2	Flow rate
%IWxy.0.4	Measurement status : stability, zero, etc
%IDxy.0.5	Tare value
%IDxy.0.7	Offset memory (zero offset)

This data is automatically returned to the processing unit at the start of the task associated with the channel, whether the **task** is in **Run** or **Stop**.

The data is directly accessible :
- from the application via operator dialogue (access to the PLC memory image objects),
- from the terminal using the animation tables.

The **weight** (see section 3 3.2, Module Configuration)

Example :
Legal format : %IDxy.0.0 = 3014 signifies (if the scale division is 2.10^{-1} kg) that the weight is 301.4 kg.
High resolution : %IDxy.0.0 = 301403 signifies (if the scale division is 2.10^{-1} kg) that the weight is 301.403 kg.

By default, if no tare order has been executed, the weight is expressed as a GROSS weight. It becomes a NET weight when a tare order is executed or when a tare is introduced manually.

The flow rate (see chapter 3 section 3.2, Module configuration)

Example :
%IDxy.0.2 = 450 000 signifies, if the scale division is 1.10^{-2} kg, that a weight difference of 45 Kg has been measured between n measurements (sampling every 20 ms). The number n of measurements is defined by the user (see module configuration).

The Measurement status word
The data word is coded as follows :

bit 15	bit 14	bit 13	bit 12	bit 11	bit 10	bit 9	bit 8
			Manual tare	Zero tracking	Zero	instability	NET weight
bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
Fault / Supervis.	Calibration	Processing in progress	Protected module	Over Satur	Under Satur	Q1	Q0

%IWxy.0.4:X0 is the image of output Q0.

%IWxy.0.4:X1 is the image of output Q1.

%IWxy.0.4:X2 indicates an excessively low voltage. The measurement is abnormal and there is a strong possibility of a sensor or wiring fault.

%IWxy.0.4:X3 indicates an excessive voltage on the module input.

%IWxy.0.4:X4 indicates a sealed module.

%IWxy.0.4:X5 indicates processing in progress (tare, zero reset, etc).

%IWxy.0.4:X6 indicates calibration during processing.

%IWxy.0.4:X7 indicates a fault during the command.

%IWxy.0.4:X8 indicates a NET weight measurement.

%IWxy.0.4:X9 indicates measurement **instability**. It is set when the measurement is outside the stability range during the time defined. The extent of the stability range and the time are defined during configuration.

%IWxy.0.4:X10 indicates zero. It is set when the zero offset is no greater than +/- 1/4 of a scale division.

%IWxy.0.4:X11 indicates that zero tracking is active.

%IWxy.0.4:X12 indicates a predefined or manual tare (language element specific to the module, accessible in read-only). It is set when the tare is not the result of a tare order but of a user entry.

%IWxy.0.4:X13 to X15 are not used.

The tare value
This word is used to display the current tare value in the same format as the weight and is memorized by the module.

The offset memory
This word is used to display the current offset in high resolution format and is memorized by the module.
It is reset to 0 at each calibration.

Validity conditions for measurements and module :
A **channel fault** bit is associated with the channel. To ensure that numerical values are valid, it is necessary to check the fault bit.

Note:
The fault bit goes to 1 when an error condition appears on the channel (underload/overload, etc). For more details about the fault, check the channel status.
In addition, there is an error detection bit **at module level**. This bit goes to 1 when the channel is faulty. In the case of this module, it is always equivalent to the previous one.

Accessing the module fault bit :

%I xy.MOD.ERR	Module fault bit

Accessing the channel fault bit:

%I xy.0.ERR	Module measurement channel fault bit

In the case of the weighing module, the module and channel data is identical.

Behavior of fault bits :
Depending on the type and seriousness of the faults, the corresponding fault bit may be transient (resets to 0 when the fault disappears) or memorized (stays at 1 even if the fault disappears).

Memorized faults	Transient faults :
- Internal fault	- Range exceeded fault
	- Application fault
	- Configuration fault
	- Communication fault
	- Protected module, parameter refused
	- Underload fault
	- Overload fault
	- Module not calibrated
	- Module tare being executed
	- Module zero reset being executed
	- Module calibration being executed
	- Module forced calibration being executed
	- Operating fault
	- Module missing

Accessing the module status

A status word is also associated with the module.

%MWxy.MOD.2	Module status

The following status word bits concern the various types of fault. In the event of a fault, the corresponding bit is set to 1.

Module status address : **%MWxy.MOD.2**	
Bit no :	Role
0	Internal fault : module is inoperative
1	Operating fault : communication or application fault
2	Terminal block fault : not used
3	Self-tests in progress on the module : not used
4	Reserved
5	Configuration fault : recognized module is not the required module
6	Module missing fault : module missing or off
7	Down_fault : not used

Accessing the various status words :

The status words are accessible by launching an explicit read operation via the READ_STS instruction. The syntax is as follows :

Read module channel status : READ_STS %CH xy.0
Read module status : READ_STS %CH xy.MOD
Access to status words is conditional on a module fault or channel fault.

Accessing channel status bits :

%MWxy.0.2	Measurement channel status

The following status word bits concern the various types of fault and channel status. In the event of a fault, the corresponding bit is set to 1.

Channel status address : **%MWxy.0.2**	
Bit no :	Role
0	External fault : overload or underload during calibration
1	Range overrun fault (1)
2	External fault : measurement module saturated
3	External fault : module sealed, configuration refused
4	Internal fault : module is inoperative
5	Configuration fault : the module present is not the module declared during configuration
6	Communication fault with the processor
7	Application fault
8	Protected module fault, parameter refused : the module refuses the parameter (if it would influence the measurement)
9	Module not calibrated
10	Overload fault
11	Underload fault
12	Tare mode
13	Zero mode
14	Calibration mode
15	Forced calibration mode

(1) This bit is only activated when the **gross filtered and measured weight** exceeds the overload threshold or is below the underload threshold. The two faults are distinguished by specific faults : underload fault or overload fault.

Comment :
Internal fault : any internal fault detected on the module sets the discrete outputs to their fallback values (electrical 0).

4.1 Introduction

To debug the weighing function, calibration must first be performed.

The commands available on the module are :

- calibration,
- zero reset,
- tare,
- gross weight feedback,
- temporary display of the manual tare,
- enable thresholds,
- disable thresholds.

The adjustments affect :

- filtering,
- the manual tare value,
- the modification of threshold values,
- the output control logic,
- the LF mask time,
- the number of measurements used to calculate the flow rate.

The operator can display the status of the main data on the following screen :
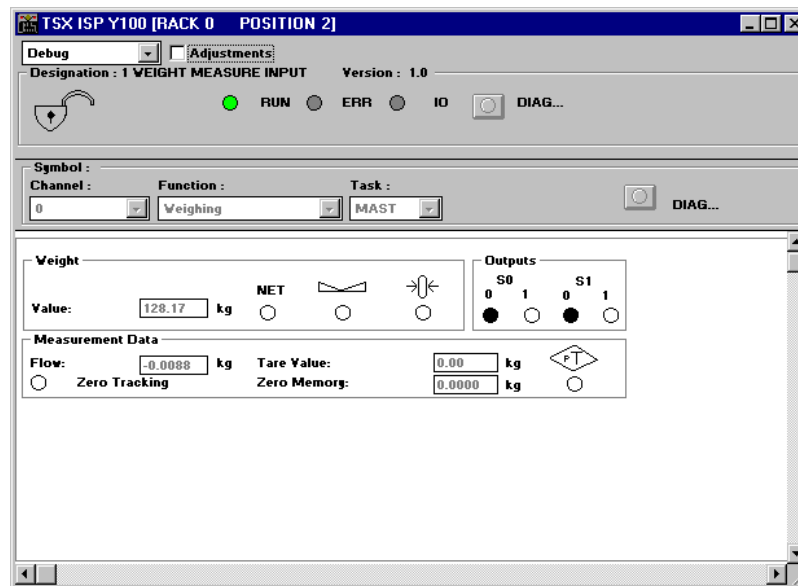
By selecting the "adjust" box, the screen displays access and additional data for executing this function.
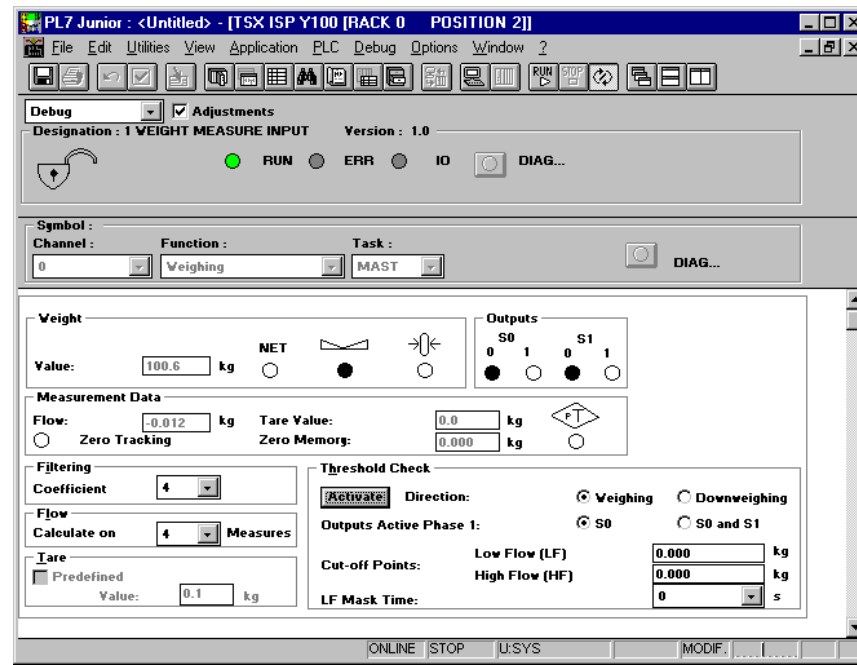
The part of the screen with a gray background gives data on the module status.
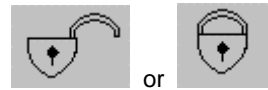
 Indicates whether or not the module is sealed (lock closed = sealed) (see section 6).

 The first indicator light shows the module operating mode. The second signals an internal error and the third an external fault (see section 2.3, Display of module status).

 This indicator light turns red in the event of a fault associated with the weighing function. Access to the fault details is via the Diag button located beneath it.

This screen consists of two 2 distinct parts :
• A **dynamic display zone** for the main data associated with weighing.

Weight					Outputs			
		NET	⊏⊐	⇥◊⇤	S0		S1	
					0	1	0	1
Value:	100.6 kg	○	●	○	●	○	●	○

Measurement Data				
Flow:	0.014 kg	Tare Value:	0.0 kg	⟨PT⟩
○ Zero Tracking		Zero Memory:	0.000 kg	○
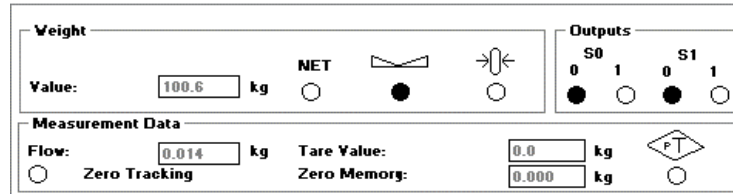
It shows dynamic data relating to :
• **Weight** :

Valeur: The value of the current weight in the defined unit. In the event of the module detecting a fault in the analog measurement system, ERR is displayed on the screen.

NET ● The Net Weight indicator light comes on if the module returns net weight data : otherwise the data is gross weight.

⊏⊐ ● The Stable Measurement indicator light shows that the measurement is within the defined stability range.

⇥◊⇤ ● The Zero Zone indicator light comes on if the weight measurement is within the zero range.

• **Outputs** :
  - The indications correspond to the physical states of outputs Q0 and Q1.
• **Measurement Data** :
  - the flow rate, indicated in units per measurement period (20 ms),
  - the current tare value,
  - the zero memory value corresponding to the zero offset since the last calibration,
  - the TW indicator light shows that the tare value has been introduced manually and not been measured,
  - the Zero tracking indicator light shows that function parameters have been set.

Note :
In the case of invalid data, ERR is displayed before the value.

● A **parameter adjustment zone**.

This is used to access modification and display of the following parameters :

● **Filtering :**
The operator may modify the value of the input measurement filter coefficient. He may select a value from 0 (unfiltered) to 19 (see section 3.2.1, configuration parameters).
Note :
The stronger the filtering, the longer the response time.

● **Flow rate** :
The operator may modify the number of measurements used to calculate the flow rate. The selection lists the values 2, 4, 8, 16, 32 and 64.

● **Tare** :
The operator may introduce a predefined tare by checking the corresponding box and entering this tare in the unit defined.

● **Threshold check** :
These parameters are only displayed if the 'threshold check' option has been activated during configuration. All parameters are taken into account once the command in the 'Edit' menu has been enabled.

- **Activate** : the operator may activate outputs Q0 and Q1.
- **Weighing/Downweighing direction** : used to modify the direction in which thresholds are taken into account.
- **Active outputs phase 1 : 'Q0' or 'Q0 and Q1'** : used to select the active outputs during the first batching phase.
- **Low flow (LF) and High flow (HF) cut-off points** : used to modify the values of these thresholds (see section 3.1.1, configuration parameters).
- **LF mask time** : used to modify the mask time delay when low flow commences.

(For more information on these parameters, see section 3.2.1, configuration parameters).

4.2 Sending commands to the weighing module

To transmit a command to the module, it is necessary to :
- first, select the type of command by setting to 1 the corresponding bit in the word "Command Type",
- second, enter the command parameter, if required (eg : standard load in high resolution format).

Language elements used to send the commands

The module command orders can be accessed in the PLC memory via the following language elements :

Command bits	Corresponding commands
%MWxy.0.3:X0	Save calibration values in module.
%MWxy.0.3:X1	Zero load calibration.
%MWxy.0.3:X2	Standard load calibration (normal condition).
%MWxy.0.3:X3	Cancel command.(1)
%MWxy.0.3:X4	Tare order.
%MWxy.0.3:X5	Zero reset order.
%MWxy.0.3:X6	GROSS weight return order.
%MWxy.0.3:X7	Display the manual tare for 3 seconds.
%MWxy.0.3:X8	Enable thresholds.
%MWxy.0.3:X9	Disable thresholds.
%MWxy.0.3:X10	Forced calibration.
%MWxy.0.3:X11	Save adjustment coefficients in processor.
%MWxy.0.3:X12	Standard load calibration in downgraded conditions (standard < 70% of maximum range).
%MWxy.0.3:X13 to X15	Not used

(1) Canceling commands only affects the following current commands : Calibration, Zero reset, Tare.

Sending commands to the module :

Commands are sent to the module using the WRITE_CMD instruction with the following syntax :

<div style="border:1px solid black; text-align:center;">

WRITE_CMD %CHxy.0

</div>

This instruction sends the order to the module and waits for it to be acknowledged. This waiting time may require several task scans.

> The module can only interpret one command at a time. If a command is required, and the previous command is still current, the latter is refused. There may never be more than one bit set to 1 in the command word.

Checking parameters have been taken into account

As several task scans may be required for the module to take commands into account, two standardized memory words check the exchanges : %MWxy.0.0 and %MWxy.0.1

> The first word, %MWxy.0.0 indicates that an exchange is in progress.
> The second word, %MWxy.0.1 gives the exchange report.

Bits %MWxy.0.0:X1 and %MWxy.0.1:X1 are associated with commands.
Bit %MWxy.0.0:X1 indicates that the command has been sent to the module.
Bit %MWxy.0.1:X1 shows whether the command has been accepted by the module.

The application fault bit of channel status %MWxy.0.2:X7 signals that a command or parameter has been refused.

4.2.1 Calibration

Calibration of the analog measurement system consists of making a weight value correspond to an electrical signal from the load cells. This is done on site, during installation, and is absolutely necessary to ensure that the measurement is valid.

All uncalibrated modules are in channel fault mode. The first calibration must be made in full (zero load and standard load). Information which is fed back is not significant.
Calibration is not possible if the PLC processor is equipped with a Flash-Eprom type memory card (TSX MFP 032P or TSX MFP 064P or TSX MFP 0128P).

It is possible to perform recalibration during the life of the module. The electronic characteristics do not require regular recalibration. However, the legal requirements or mechanical characteristics of the application may require this calibration, especially for commercial transactions.

Three commands are described in this paragraph :
- normal calibration (the calibration function must be executed with a standard load $\geq$ 70% the maximum range),
- downgraded calibration (if, for whatever reason, the calibration cannot be executed in the conditions described above),
- forced calibration (to recover adjustments executed on a different module for maintenance or duplication purposes).

Calibration principle :
Calibration is executed in two stages :
- Zero (zero load), determines the offset,
- Standard load, used to define the analog measurement system gain.

Calibration operating mode
In calibration mode, the channel is signaled as faulty.

Calibration method
Calibration may be executed on a PL7 station connected to the PLC by means of the calibration screen.
It may be also be executed via a man-machine interface using PL7 language instructions.

Calibration precautions
Any change in the load cell supply requires full recalibration. This calibration forces outputs Q0 and Q1 to 0.

Note :
Calibration is independent of the configured filter, but takes into account the Metrological Data, Stability and Load Cell Power Supply parameters from the Configuration screen.

Calibration screen

To facilitate this operation, a calibration screen can be accessed from the operating screen.

The upper part displays the weight and its characteristics (Net or Gross) : the lower left of the screen is used to execute calibration and the lower right of the screen is used to force calibration.
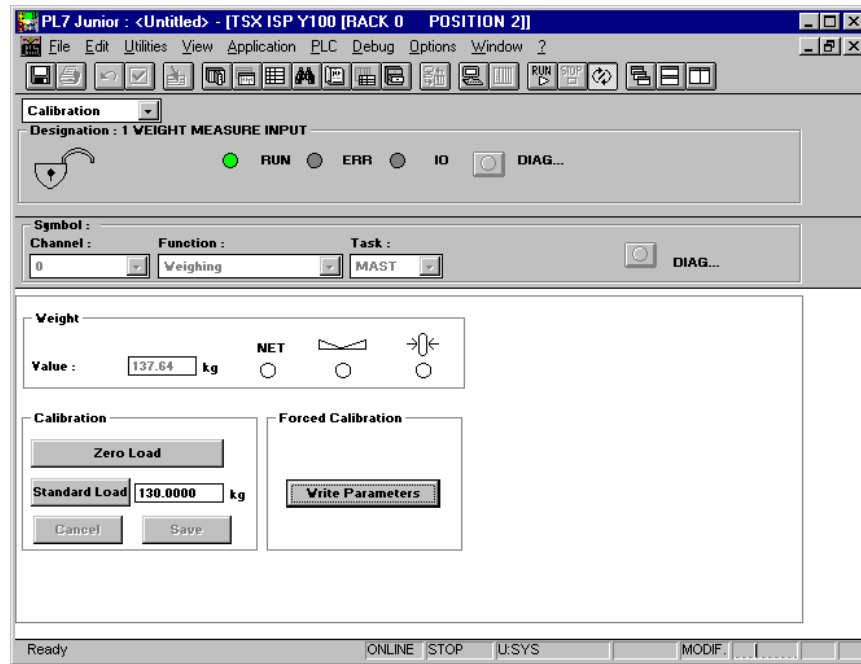
Calibration procedure using the calibration screen

User operations with the screen	Module behavior
Power up the rack.	The product is initialized, performs self-tests and receives its configuration.
Enter data in the Calibration screen via the command status screen	
Check that the weigher is empty	
Execute **zero load calibration** (take load receptacle into account). The zero load calibration command is executed by selecting the load under "Zero load" on the calibration screen. ⇩	This phase requires approximately one minute. The "Zero load" changes to reverse video during this phase and an hour-glass icon appears. The module changes to channel fault and no measurements are valid : The Calibration_in_progress indicator light changes state, The module indicates that the zero load reference has been acquired and processes the reports :
Position the **standard load**	
Enter the value of the standard load and execute the standard load calibration command. The standard load calibration is ordered by selecting the load under "Standard load" on the calibration screen. ⇩ If the measurement is stable (1), the standard load calibration is executed	This phase requires approximately one minute. The module verifies the standard load in relation to the maximum range (2). The Calibration_in_progress indicator light changes state, The module reads the standard load reference and processes and determines the reports.

(1) If the measurement is unstable, a message signals the fault : "Provisional adjustment, unstable weigher". Accept : Accept the measurement and save it. Cancel : Quit the current phase.
(2) If the Standard load / Maximum Range ratio is less than 70%, the message "Calibration conditions not satisfactory, standard load is too low" alerts the operator. The operator may accept the adjustment under these conditions by selecting the "Accept" key or recommence calibration using the "Quit" key.
Note :
The stability check is only possible if a zero load calibration and a standard load calibration have been executed.
Partial calibration phases are possible but do not enable the optimum characteristics of the analog measurement system to be used.

Save or Cancel the calibration procedure :	
Save	→ the module and the processor take into account the parameters resulting from the calibration. These parameters are saved in the module. During the write phase, the measurement remains in channel fault. This fault disappears as soon as the write operation is executed (channel fault and calibration in progress disappear). The measurement is valid.
Cancel	→ the module reverts to its previous parameters. The application fault disappears. The measurement is valid.
Quit the calibration screen : "status/command" button ⇩ Return to the command status screen	

Comment :
The procedure can be stopped at any time by pressing 'Cancel'. The module reverts to its previous parameters. The current calibration parameters are lost.

The validation of the procedure is effective only if the calibration has in fact been executed in the module. If there is a calibration problem (standard load reference values outside permitted limits, etc), the screen cannot be validated. Either the error must be corrected or the procedure must be canceled via "Cancel".

Forced calibration
This function responds to the need for rapid maintenance procedures (immediate module replacement).
It consists of loading the adjustments made using one module into another module. These adjustments are saved at the time of the last calibration executed on the replaced module.
Using the 'Load' key, the user imports the adjustments stored in the processor.
This operation may also be performed by setting the associated command bit, %MWxy.0.3:X10, to 1.
Note :
The next calibration must be made in full (zero load and standard load).
If a module fails and the operator wishes to replace it quickly, he may force the calibration of the previous module.

Data associated with the calibration

Several language elements are used to create and supervise the calibration mechanism. The calibration screen facilitates this procedure, but it may also be directly performed using reserved data.

- A **command word** :
  This is word %MWxy.0.3 : this word is updated during calibration.

  - **Save calibration** (%MWxy.0.3:X0) : order (if =1) sent to the module to validate and save the parameters determined in the calibration phase.
  - **Standard load** (%MWxy.0.3:X2) : order (if =1) sent to the module to calibrate the channel using the standard load.
  - **Zero load** (%MWxy.0.3:X1) : order (if =1) sent to the module to calibrate the channel using the zero load.

- **A control parameter** containing the value of the **standard load** : this is word %MD xy.0.4 (high resolution format).

- **A status bit**
  - **Calibration in progress :** status bit sent by the module which changes state at the beginning and end of calibration.
    Bit 9 (uncalibrated module fault) of word %MWxy.0.2 is set, until the first calibration order.

The table below shows the data involved during calibration :

Type of command	Associated data
Save calibration in module	%MWxy.0.3:X0
Zero load	%MWxy.0.3:X1
Standard load (normal)	%MWxy.0.3:X2
Forced calibration	%MWxy.0.3:X10
Save calibration in processor	%MWxy.0.3:X11
Standard load (downgraded)	%MWxy.0.3:X12
Control parameter	**Associated data**
Value of the standard load	%MD xy.0.4
Report	**Associated data**
Calibration in progress	%IW xy.0.4:X6
Instability	%IW xy.0.4:X9
Overload or underload during calibration.	%MWxy.0.2:X0
Uncalibrated module	%MWxy.0.2:X9
Calibration mode	%MWxy.0.2:X14
Forced calibration mode	%MWxy.0.2:X15

4.2.2 Saving adjustments in the processor

If the calibration screen is used during calibration, the "Save" key saves the parameters both in the module and in the processor provided the application is not on a write-protected cartridge.

A command exists which enables current weighing module adjustment parameters to be saved directly in the processor.

This function is triggered by setting bit **%MWxy.0.3:X11** to 1.

4.2.3 Tare

When a load, called the tare, is placed on the load receptacle, this function sets its measured NET weight to zero. An offset value can then be applied to the measurement to ensure it conforms to the value required by the user.

The tare value is accessible in the PLC memory : it is stored in word %ID xy.0.5, in the weight format.
It may be saved by the application.

Note :
When no tare operation has been executed, the NET weight is equivalent to the GROSS weight.

Tare execution conditions
The acceptance conditions for execution of the Tare command are as follows :
• The measurement is stable.
• The measurement is less than the maximum range.
• The measurement must be positive.

Tare procedure using Tare command

User operations	Module behavior
1 - Enter WRITE_CMD setting the tare order (%MWxy.0.3:X4 = 1).	
2 - Confirm execution, application in RUN.	The module switches to tare mode and sends the Processing_in_progress report %IWxy.0.4:X5 = 1. Proceed to tare acquisition. **Note :** the weight is measured and memorized in the associated object %IDxy.0.5. It will be subtracted from any subsequent GROSS weight measurement to determine the NET weight. End acquisition : Processing_in_progress = 0
3 - Check successful execution of command : Status of Processing_in_progress %IWxy.0.4:X5	

The module remains in Processing_in_progress state as long as the acceptance conditions are not fulfilled or no cancel command order is received.

> **Comment :**
> All tare values are deleted when the configuration is changed.
> Execution of a Tare command deletes any tare entered in manual mode (WRITE_PARAM) and resets the "manual" tare indicator to zero.

Similarly, a GROSS weight return order enables any tare to be deleted. No acceptance conditions are necessary.

The table below summarizes the data used for a tare.

Command	Associated data
Tare order	%MWxy.0.3:X4
Display	Associated data
Tare value	%IDxy.0.5
Tare in progress	%IWxy.0.4:X5

Example :
Send a tare order to the weighing module at slot 2 of rack 0

```
LD TRUE
S  %MW 2.0.3:X4
[WRITE_CMD  %CH2.0]
```

This order involves :

- Sending the command.
- Setting bit %MW2.0.0:X1 to 1 to indicate that the command is currently being sent. This bit remains at 1 until the module sends a report. The bit then returns to 0 and the exchange report bit becomes significant.
- Exchange report bit %MW2.0.1:X1 sets to 1 in the event of problems during the exchange. Value 0 indicates that the command has been accepted by the module.

%IW2.0.4:X5 remains at 1 (processing in progress) as long as the acceptance conditions are not fulfilled (for example awaiting measurement stability). The application fault bit for the channel status is set to 1 (module currently executing command).
As for all commands, the order may be canceled by sending the command "cancel current command".

4.2.4 Zero reset

This function consists of setting the measured weight to zero and canceling any tare. The zero indicator light is then set.
It is controlled by the Zero Reset command.

Corrections to the measurement are stored in word %IDxy.0.7 in high resolution format. They may be saved by the application. This parameter is reset to zero on each calibration.

Conditions for executing zero reset
The acceptance conditions for executing zero reset are as follows :
- The measurement is in GROSS weight.
- The measurement is stable.
- The measurement must be within the extent of the zero range as defined during configuration.

Zero Reset procedure via the Zero Reset command

User operations	Module behavior
1 - Enter WRITE_CMD setting the Zero Reset order (%MWxy.0.3:X5 = 1).	
2 - Confirm execution with application in RUN.	The module switches to zero_reset mode and sends the Processing_in_progress report %IWxy.0.4:X5 = 1. The module then acquires the measurement and memorizes the new value in the offset memory %IDxy.0.7. Processing_in_progress = 0 signifies the end of the procedure.
3 - Check successful execution of command : Status of Processing_in_progress	

Note :
The module remains in the Processing_in_progress state as long as the acceptance conditions are not fulfilled or no cancel command order is received.

All zero resets are deleted when the configuration is changed.

The table below summarizes the data used for a zero reset.

Command	Associated data
Zero reset order	%MWxy.0.3:X5
Display	Associated data
Offset memory	%IDxy.0.7
Report	Associated data
Processing in progress	%IWxy.0.4:X5

Example :

Send a Zero_Reset order to the weighing module at slot 2 of rack 0

```
LD  TRUE
S  %MW 2.0.3:X5
[WRITE_CMD   %CH2.0]
```

This order involves :
- Sending the command.
- Setting bit %MW2.0.0:X1 to 1 to indicate that the command is currently being sent. This bit remains at 1 until the module sends a report. The bit then returns to 0 and the exchange report bit becomes significant.
- Exchange report bit %MW2.0.1:X1 sets to 1 in the event of problems during the exchange. Value 0 indicates that the command has been accepted by the module.

%IW2.0.4:X5 remains at 1 (processing in progress) as long as the acceptance conditions are not fulfilled (for example awaiting measurement stability). The status channel application fault bit is set to 1 (module currently executing command).

As for all commands, the order may be canceled by sending the command "cancel current command

4.2.5 Order to return to gross weight

This function consists of canceling the tare value so that the current weight equals the gross weight.

The current weight is stored in word %IDxy.0.0 in the format defined during configuration.

Conditions for executing the return to gross weight
This command requires no special execution conditions.

Procedure to return to gross weight via the return to gross weight command

User operations	Module behavior
1 - Enter WRITE_CMD setting the Return to gross weight order (%MWxy.0.3:X6 = 1).	
2 - Confirm execution with application in RUN.	The module switches to return to gross weight mode. The module proceeds to reset the tare to zero The Net indicator = 0 signifies the end of the procedure (%IWxy.0.4:X8 = 0).
3 - Check successful execution of command : Status of Net indicator	

The table below summarizes the data used for a zero reset..

Command	Associated data
Return to gross weight order	%MWxy.0.3:X6
Display	Associated data
Weight measured	%IDxy.0.0
Current tare value	%IDxy.0.5
Report	Associated data
Processing in progress	%IWxy.0.4:X5
Gross weight	%IWxy.0.4:X8 = 0

4.2.6 Order to display manual tare for 3 seconds

This function is used to display the manual tare on the display unit for 3 seconds.

Conditions for executing
This command requires a manual tare to have been configured.

Procedure to freeze measurement

User operations	Module behavior
1 - Enter WRITE_CMD setting temporary display of manual tare order (%MWxy.0.3:X7 = 1).	
2 - Confirm execution with application in RUN.	The module manages data normally. The values displayed on the TSX XBT H100 give the value of the manual tare.
3 - At the end of 3 seconds, the display unit once more shows current values.	

The table below summarizes the data used for freezing measurement.

Command	Associated data
Display tare order	%MWxy.0.3:X7
Display	Associated data
The data on the display unit shows the manual tare.	

4.2.7 Orders to enable and disable thresholds

These functions are mainly used to coordinate the control of outputs in relation to the control system managed by the processor. The control thresholds option must have previously been confirmed on the configuration screen.

Operating principle
Action on the outputs is executed via the "Validate Thresholds" command.
When this command is executed, the threshold control cycle is triggered. It stops when the condition corresponding to the Low flow cut-off point is reached.
A disable command may, if necessary, stop the control cycle and reset outputs Q0 and Q1 to 0.

Procedure to Enable thresholds

User operations	Module behavior
1- Enter a WRITE_CMD to set the threshold enable order. (%MWxy.0.3:X8 = 1).	
2 - With the application in RUN, modify the threshold values, output logic and mask time as required (see adjustment). End of adjustment	Modifications taken into account by the module
3 - Launch the threshold enable operation using the WRITE_CMD instruction	The module interprets the request, sets outputs Q0 and Q1 and the corresponding image bits : %IWxy.0.4:X0 and %IWxy.0.4:X1.

Procedure to Disable thresholds

Operations user	Behavior of the module
1 - Enter a WRITE_CMD to set the threshold disable order. (%MWxy.0.3:X9 = 1).	
2 - Confirm execution with application in RUN.	The module sets the outputs to rest state and sets the image bits to 0.

Language elements associated with threshold control

The table below summarizes the data used to enable and disable thresholds :

Command	Associated data
Enable threshold order	%MWxy.0.3:X8
Disable threshold order	%MWxy.0.3:X9
Display	Associated data
Current flow rate	%IDxy.0.2
High flow threshold	%MDxy.0.8
Low flow threshold	%MDxy.0.10
Output logic	%MWxy.0.12.
LF masking time	%MWxy.0.13.
Current position of Q0	%IWxy.0.4:X0
Current position of Q1	%IWxy.0.4:X1

4.3 Adjustments

Adapting the process and customizing the measurement

Depending on the operation to be performed or the product to be processed, the process may require modification of output behavior, modification in the number of samples used to calculate the flow rate, etc.
These modifications are performed using the following data (see section 4.3.2):

Adjustable parameters :	Corresponding data
Filtering coefficient	%MWxy.0.6
"Manual" tare value	%MWxy.0.7
Cut-off points (thresholds)	%MDxy.0.8 & %MDxy.0.10
Q0 and Q1 output logic	%MWxy.0.12
LF mask time	%MWxy.0.13
Number of measurements used to calculate the flow rate	%MWxy.0.14

The user may :
• Modify an adjustment parameter via a program,
• Send the adjustment parameters to the module,
• Check that the module is taking the parameters into account,
• Read the value of the adjustment parameters in the module and thus update the PLC memory,
• Save the adjustment parameters,
• Restore the value of the saved parameters to the PLC memory.

The instructions used for these operations are as follows :

Instruction	Function performed
WRITE_PARAM %CH xy.0	Sends the contents of the parameters on the previous table to the weighing module
READ_PARAM %CH xy.0	Reads the adjustment parameters in the module and updates the table previously mentioned.
SAVE_PARAM %CH xy.0	Saves the adjustment parameter values in the processor memory zone. These parameter values are those used on a PLC cold restart.
RESTORE_PARAM %CH xy.0	Used to reload the adjustment parameters with the values entered during module configuration or on the last SAVE_PARAM

The module can process several adjustments simultaneously.

4.3.1 PL7 instructions used for adjustment

The user may access the CPU data memory via PL7. To perform adjustment operations, access to the module data itself is required. Access is via specific instructions which provide the following functions.

Send the adjustment parameters to the module :

The **module** channel parameters are sent using the **WRITE_PARAM** instruction with the following syntax :

> WRITE_PARAM %CH xy.0

This instruction sends the contents of the parameters to the module and waits for acknowledgment. This may require several task cycles.

Checking parameters have been taken into account

As several task scans may be required for the module to take commands into account, two memory words are used to check the exchanges :

> %MWxy.0.0 and %MWxy.0.1

- The first word **%MWx**y.0.0 indicates that an exchange is in progress,
- The second word **%MWx**y.0.1 gives the exchange report,
- Bits with the number 2 are associated with adjustment parameters :

  - Bit %MWxy.0.0:X2 indicates that adjustment parameters have been sent to the module,
  - Bit %MWxy.0.1:X2 shows whether the adjustment parameters have been accepted by the module.

Example :

Write the parameters of the module at slot 2 of rack 0:

WRITE_PARAM %CH2.0 involves :

- Sending the adjustment parameters,
- Setting bit %MW2.0.0:X2 to 1 to indicate that the adjustment parameters are currently being sent. This bit remains at 1 until the module sends a report. The bit then returns to 0 and the exchange report bit becomes significant.
- Exchange report bit %MW2.0.1:X2 sets to 1 in the event of problems during the exchange. Value 0 indicates that the data has been accepted by the module.

If the module is protected (sealed), modification of the filtering coefficient is not authorized. If a WRITE_PARAM instruction is sent to the module with a filtering coefficient which is different from the current coefficient, the application fault (illegal parameters received) and the sealed module fault are set. The module continues to use the current filtering coefficient.

Reading the adjustment parameters values :

The **READ_PARAM** instruction is used to read the **module** adjustment parameters and update the PLC memory. Reading the adjustment parameters may require several task cycles.

The adjustment parameters for the module channel are read via the READ_PARAM instruction with the following syntax :

READ_PARAM %CH xy.0

Saving adjustment parameters :

The **SAVE_PARAM** instruction is used to copy the current values of the module adjustment parameters to the back-up zone defined in the processor memory. The back-up zone is not accessible using the language .
Its execution may require several task cycles.
Module adjustment parameters are saved via the SAVE_PARAM instruction with the following syntax :

SAVE_PARAM %CH xy.0

Restoring the saved adjustment parameters :

The **RESTORE_PARAM** instruction is used to restore the saved values of adjustment parameters in the processor memory and in the module.
Module adjustment parameters are restored via the RESTORE_PARAM instruction with the following syntax :

RESTORE_PARAM %CH xy.0

4.3.2 Adjustment parameters

Filtering coefficient :

%MWxy.0.6	Filtering coefficient

The permitted values for the filtering coefficient are between 0 and 19 inclusive.

"Manual" tare value :

%MWxy.0.7	manual tare value

The permitted values for the "manual" tare value are between 0 and 65 535 inclusive : they may not exceed the maximum range.

Cut-off points (thresholds) :

%MD xy.0.8	High flow cut-off point Q0
%MD xy.0.10	Low flow cut-off point Q1

The permitted values for thresholds are between 0 and the maximum range in high resolution format.

If no threshold check has been defined during configuration, no detection processing is executed. The default value of these thresholds is zero.

Note :
- In weighing HF < LF < Maximum range,
- In downweighing LF < HF < Maximum range.

The module performs a threshold value consistency check. If this logic is not observed, the thresholds are refused.

Output logic :

%MWxy.0.12	Output logic
%MWxy.0.12:X0	**0**: Weighing **1**: Downweighing
%MWxy.0.12:X1	**0**: Q0 then Q1 **1**: Q0 and Q1 then Q1

LF mask time :

%MWxy.0.13	**LF** mask time

The permitted values are between 0 and 15 in steps of $1/10^{th}$ second (0 = 0s, 1= 0.1s, 2 = 0.2s, etc).

Number of measurements used to calculate the flow rate :

%MWxy.0.14	Number of measurements used for flow rate

The permitted values are 2, 4, 8, 16, 32 or 64.

4.3.3 Adjustment procedures

The user may perform certain adjustment operations :

Adjustment procedure for measurement filtering (%MWxy.0.6)

To adjust measurement filtering, proceed in a step-by-step fashion until satisfactory measurement characteristics are obtained.

**Adjustment procedure for thresholds and outputs
(%MDx0.8, %MDx0.10, %MWx0.12, %MWx0.13, %MWx0.14)**

To adjust thresholds, proceed as follows :
When batching finishes, the program is able to measure the in-flight error by calculating the differential between the weight of the product in the weigher and the theoretical batch setting for the product. Using this measurement, it can correct the in-flight error parameter or the low flow quantity parameter according to the formula selected, if necessary taking flow rates into account. The threshold(s) are then modified and sent back to the module.

Note :
The thresholds are calculated by the application, as a function of the batching quantity, the in-flight error and the low flow quantity, in accordance the following formulae :
Low flow cut-off point = batch setting - in-flight error
High flow cut-off point = Low flow cut-off point - low flow quantity

Procedure for adjusting the number of measurements used for the flow rate (%Mwx0.14)

To adjust the number of samples used to the calculate the flow rate, proceed step-by-step until satisfactory measurement characteristics are obtained.

4.3.4 Reading configuration parameters

All parameters entered during **module** configuration can be accessed via the program in read-only mode.

Maximum range :
The maximum range configured for the measurement channel can be read by memory word %KW in the constant zone. It has the following syntax :

%KW xy.0.0

Unit/Scale division :
The unit and the scale division, configured for the measurement channel, can be read by memory word %KW in the constant zone. The scale division is always defined in the same unit as the measurement and has the following syntax :

%KW xy.0.1

with the unit coded on 3 bits of the low order byte

bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
				Unit			
(bits 0 to 2 used)				**Corresponding unit**			
0				g			
1				kg			
2				t			
3				LB			
4				oz			
5				no unit			

and the scale division coded on 5 bits of the high order byte

bit 15	bit 14	bit 13	bit 12	bit 11	bit 10	bit 9	bit 8
				Scale division			
$(2^8$ to $2^{12})$	Scale division value			$(2^8$ to $2^{12})$	Scale division value		
0	0.001			11	5		
1	0.002			12	10		
2	0.005			13	20		
3	0.01			14	50		
4	0.02			15	100		
5	0.05			16	200		
6	0.1			17	500		
7	0.2			18	1000		
8	0.5			19	2000		
9	1			20	5000		
10	2						

Stability / Zero / Overload threshold / Use of outputs/ format :
The extent of the range and of the stability time, the extent of the zero range and of the activity of zero tracking, of the overload threshold, the use of outputs and the weight formats, configured for the measurement channel, can be read by memory word %KW in the constant zone. It has the following syntax :

%KW xy.0.2

bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
Time of stability				Extent of stability			

bit 15	bit 14	bit 13	bit 12	bit 11	bit 10	bit 9	bit 8
Format	Outputs	Zero track. active	Manual tare	Zero extent	Load cell supply	Overload	

Detail of bits 0 to 2 :

Extent of stability : (bits 0 to 2)	
Value read	equivalent (in 1/4 scale division)
0	2
1	3
2	4
3	6
4	8

Detail of bits 4 to 5 :

Stability time : (bits 4 to 5)	
Value read	equivalent (in seconds)
0	0.4
1	0.5
2	0.7
3	1

Overload : (bits 8 to 9)	
Values read	Type of overload selected
0	Maximum range + 9 scale divisions
1	Maximum range + 2% of maximum range
2	Maximum range + 5% of maximum range

Load cell power supply : (bit 10)	
bit 10 at 0	Continuous
bit 10 at 1	Switched

Extent of zero : (bit 11)	
bit 11 at 0	±2% of maximum range
bit 11 at 1	±5% of maximum range

Predefined tare : (bit 12)	
bit 12 at 0	No predefined tare
bit 12 at 1	Predefined tare

Zero tracking activity : (bit 13)	
bit 13 at 0	Zero tracking inactive
bit 13 at 1	Zero tracking active

Use of outputs : (bit 14)	
bit 14 at 0	Outputs not used
bit 14 at 1	Outputs used

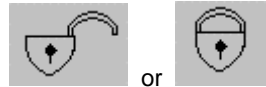| Format : (bit 15)	
bit 15 at 0	Legal format (physical unit with fixed decimal)
bit 15 at 1	High resolution (1/100th physical unit with fixed decimal)

5.1 Weighing operation using PL7

Once the weighing application is operational, it may be supervised via the debug screen.
The Debug screen dynamically shows the principal weight measurement data.
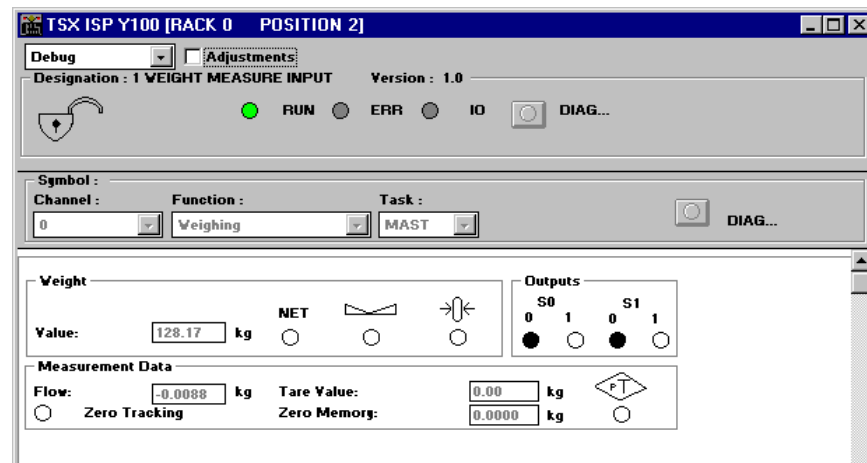
Module information

        Indicates whether or not the module is sealed (lock closed = sealed) (see section 6).
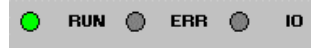
        The first indicator light shows the module operating mode. The second signals an internal error and the third an external fault (see section 2.3, display of module status).
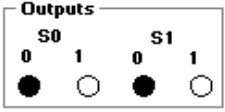
        This indicator light turns red in the event of a fault associated with the weighing function. Access to the fault details is via the Diag button located beneath it (see PL7 Junior, section E, module diagnostics).

Weight data

|	
`Value` ⬚ **g**	Gives the current value of the weight measured.
NET ◯	If the indicator light is on, shows that the weight shown is Net weight (= Gross Weight - Tare).
◯	If the indicator light is on, shows that the measurement is stable, ie. that it is within a range around a point for a time which conforms to the values defined during configuration.
→◯← ◯	If the indicator light is on, shows that the measurement performed is within the zero range (defined on the configuration screen).

Output data

┌ Outputs ──────── S0 S1 0 1 0 1 ● ◯ ● ◯	Shows the current state of discrete outputs Q0 and Q1.

Measurement data

Flow: `0.0243` **kg**	Indicates the current flow rate calculated by the weight unit per measurement period (20 ms).
◯ **Zero Tracking**	If the indicator light is on, shows that the zero tracking option is in use (configuration screen).
Tare Value: `0.00` **kg**	Indicates the current tare value.
Zero Memory: `0.0000` **kg**	Corresponds to the accumulation of offsets following zero reset commands since the last calibration.
◇P◇ ◯	Indicates that the tare is predefined.

All measurement data is also accessible in the form of PLC variables and may be displayed in animation tables.

Data displayed	Object address
Protected module	%MWxy.0.2:X8
Uncalibrated module	%MWxy.0.2:X9
Weight	%IDxy.0.0
Net weight indicator	%IWxy.0.4:X8
Stability indicator	%IWxy.0.4:X9
Zero range indicator	%IWxy.0.4:X10
State of discrete output Q0	%IWxy.0.4:X0
State of discrete output Q1	%IWxy.0.4:X1
Flow rate	%IDxy.0.2
Tare value	%IDxy.0.5
Offset memory	%IDxy.0.7
Zero tracking indicator	%IWxy.0.4:X11
Predefined tare indicator	%IWxy.0.4:X12

5.2 The display report

The data sent from the module to the display unit are metrological indicators (see installation documentation for TSX XBT H100).
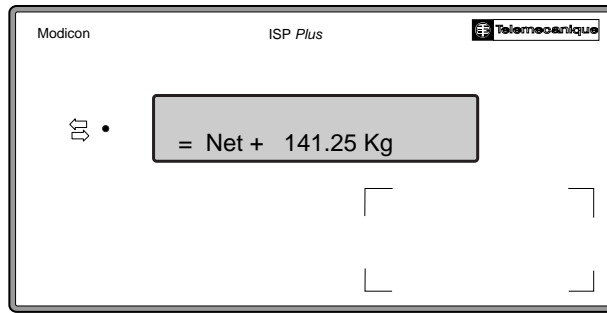
This report indicates :
- whether the measurement is stable, by the sign =,
- whether the measurement concerns a Net weight (Net) or a Gross weight (if unspecified),
- whether the measurement is positive (+) or negative (-) or whether it is around zero (small 0).
- signed numerical data for the current weight,
- the name or symbol of the measurement unit of weight,
- (g for gram, kg for kilogram, lb for pound, oz for ounce and t for tonne).

Note:
The serial link is tested when the weighing module is powered up. The XBT must be connected to the TX ISP Y100 when the PLC is powered up.

All valid measurements are transmitted to the display every 100 ms in physical units with a fixed decimal point.
If the channel fault is set, the measurement is replaced by the following line of characters :' -------'. In the event of overload, it displays '>>>>>' and in the event of underload, it displays '<<<<<' .
The display unit continuously monitors data reception. If no data is received (because of disconnection, non-transmission by the module, etc) the 'Time Out' error is displayed.
When the TSX XBT H100 is powered up it runs a test on its resources. All data received is checked during operation. In the event of problems, the "checksum" error is displayed.

Note:
A space is reserved on the stamped identification plate of the TSX XBT H100 to satisfy the legal requirements for metrology.

5.3 Operating mode

When the module is powered up it runs self-tests (REPROM, RAM, display unit link, etc).
If a fault is detected following these tests, the module goes to fallback mode and the outputs go to 0.
The same occurs during normal operation if an internal module malfunction (fault on RAM, watchdog, etc) is detected : the outputs go to 0 and dashes (----) appear on the screen.

Operating modes [module]

```
              ┌───────┐
              │   *   │
              └───┬───┘
                  │ off
              ┌───┴────┐
              │ Missing│
              └───┬────┘
                  │ on
             ┌────┴─────┐
             │ Self-tests│
             └──┬─────┬──┘
   Internal fault    End self-tests
       ┌───┐            ┌───────┐
       │Fail│◁── Internal fault ──│ Valid │
       └───┘            └───────┘
```
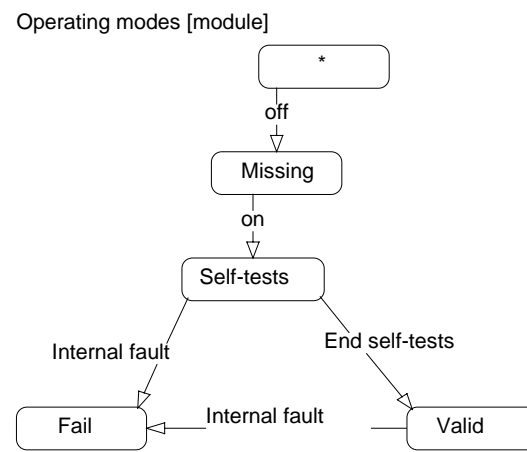
On power outage, the machine parameters (Tare, Zero offset, etc) are saved. The operating parameters (Thresholds, Number of measurements used to calculate the flow rate, etc) are however lost.

6.1 Adjustment protection procedure

Sealing :
All weighing instruments used for commercial transactions must be approved. The parameters associated with measurement must therefore be protected.
It must not be possible to introduce, via the interface of an instrument, instructions or data which can be used to :
• falsify the weighing results displayed,
• change an adjustment factor.

Note:
Protection by sealing is intended to guarantee measurement conformity, the accessible parameters therefore only affect module data use by the control system.

Protection procedure

Once calibration and adjustment are complete, the module may be protected.
To do this, remove the module from the rack (the rack may remain powered up), then remove the casing.
The module protective jumper is located behind the module display unit. To activate the protection system, place the jumper across 2-3 as shown in the diagram.

Connector on base of rack

Display unit

1
2
3

Jumper position for module protection
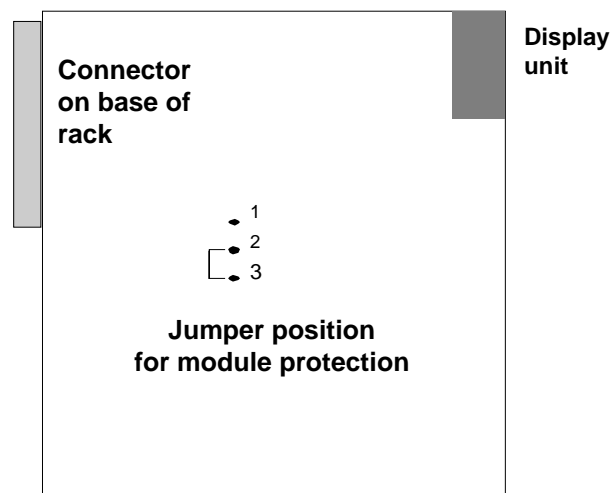
Replace the module in its casing, then replace it in the PLC.

Note:
To open the casing, use a TORX type screwdriver

Effect of protection system on configuration parameters

There are two distinct types of data. Data maybe protected (once the module is sealed, this type of data can only be accessed in read-only mode) and open-access data (Read and Write modes).

The table below identifies the characteristics of this data depending on whether the protection system is operational.

functions	unsealed	sealed
Task	Modifiable	Modifiable
Unite	Modifiable	Not modifiable
Maximum Range (MR)	Modifiable	Not modifiable
Scale division	Modifiable	Not modifiable
Overload threshold	Modifiable	Not modifiable
Filtering/ Coefficient	Modifiable	Not modifiable
Flow rate/ Calculation on n measurements	Modifiable	Modifiable
Tare/ Predefined	Modifiable	Modifiable
Data format	Modifiable	Not modifiable
Stability/ Extent of range	Modifiable	Not modifiable
Stability / Time	Modifiable	Not modifiable
Zero/ Zero tracking	Modifiable	Not modifiable
Zero/ Extent of range	Modifiable	Not modifiable
Threshold check/ Active	Modifiable	Modifiable
Threshold check / Direction	Modifiable	Modifiable
Threshold check / Active outputs	Modifiable	Modifiable
Threshold check / Cut-off points	Modifiable	Modifiable
Threshold check / TF mask time	Modifiable	Modifiable
Load cell power supply	Modifiable	Not modifiable

Data word %IWxy.0.4:X4 (at 1) indicates whether or not the measurement is protected.

Consequences of a protection system

- A sealed module which receives a different configuration from that memorized (before the power is switched off prior to moving the jumper) is refused.
- In this case, the module will appear to be missing in the PLC diagnostics, but transmits a weight to the display unit.

Comment :
Using the documentation enables a paper record of the configuration to be kept.

- The filtering of a sealed module cannot be modified.

- A sealed module will not accept a new request for calibration.

6.2 Metrology legal requirements and regulations

6.2.1 CE type approval

The assembly consisting of the weighing hopper + sensors + module may be considered to be a non-automatic weighing instrument.
To qualify for this description, and to be authorized for use in commercial transactions, it has received CE type approval.

If it is only for use in internal processes, the display must have an identification plate showing :

Manufacturer's trademark	Max =
Type of instrument	sd =
Serial number	
'Not legal for trade'	

If it is for use in commercial transactions, the display must have a stamped identification plate showing :

Manufacturer's trademark	Max =
Type of instrument	Min =
Serial number	sd =
SDM No. 97.06	

In addition, it must be initially checked when it leaves the factory and regularly checked on site by an approved organization. These checks must in general be performed every years, and are the responsibility of the owner of the instrument.

6.2.2 Approval for national model

- **Measurement and automatic operation equipment for weigher dosers and circuit weighers with batch totalizer**

This non-automatic weighing instrument may be complemented with application-specific programs, the 'Weigher Doser' or 'circuit weigher with batch totalizer'. To qualify for this description, weighing instruments must have national approvals for use as measurement and control apparatus for the automatic operation of weigher dosers and circuit weigher with batch totalizer.

Manufacturers of weigher dosers or circuit weigher with batch totalizer can then very simply obtain approval for automatic weighing instruments.

Machine manufacturers have also to provide the identification plate and, if necessary, present the machine for initial checking.

Approval for model with continuous totalizer

When associated with a weighing table, it is approved as a continuous totalizer.

When not for use in commercial transactions, the nameplate shows :

- Trademark	Qmax =
- type	dt =
- Serial no.	
'Not legal for trade'	

When the intended use involves commercial transactions, the identification plate shows :

- Trademark	Qmax =
- type	dt =
- Serial no	
Products weighed :	
- Max =	L =
- v =	d =

It must also be checked. The first phase of initial checking is performed in the factory on the finished instrument, not connected to its transporter, using a movement simulator : other phases are performed on the finished instrument.

6.2.3 Class of apparatus

For normal precision, the apparatus covers a range of resolution from 100 to 1000 scale divisions inclusive.

For average precision, the apparatus covers a range from the minimum (500 scale divisions) up to 6000 scale divisions. These instruments may or may not be authorized for commercial transactions. If not, the legend 'NOT LEGAL FOR TRADE' must appear on the front panel of the apparatus.

7.1 Example of tare operation

Important : this section highlights the control of a weighing process by stressing the essential operations to be executed.

The operation involves a conversion to a NET weight (taring).
Bit %M101 is used to perform this action. When set, it causes the gross weight currently being measured to be taken into account as the weighing tare, then the display unit to switch to NET mode.

```
! (* Sealed weighing module, slot 6 *)
! (* Awaiting tare conditions *)
    IF %M100 THEN
      IF NOT %MW6.0:X1 AND NOT %MW6.0.1:X1
      THEN
        SET %M101;
        RESET %M100;
      ELSE
        RETURN;
      END IF;
    END IF
! (* Tare *)
    IF %M101 THEN
      (* send tare order *)
      IF NOT %MW6.0:X1 AND NOT %MW6.0.1:X1 AND NOT %M102 THEN
        %MW6.0.3:=0;
        SET %MW6.0.3:X4;
        WRITE CMD %CH6.0;
        SET %M102;
      END IF;
      (* tare completed and OK *)
      IF NOT %MW6.0:X1 AND NOT %MW6.0.1:X1 THEN
        %MW6.0.3:=0;
        RESET %M101;
        RESET %M102;
        SET %M103;
      ELSE
      (* tare refused => error *)
        IF NOT %MW6.0:X1 AND %MW6.0.1:X1 THEN
          SET %M200;
          %MW6.0.3:=0;
          RESET %M101;
          RESET %M102;
          RESET %MW6.0.1:X1;
          SET %M100;
        END IF;
      END IF;
    END_IF;
```

%MW6.0:X1	Exchange in progress
%MW6.0.1:X1	Exchange report
%MW6.0.3:X4	Tare order
%MW6.0.3	Command order (tare, calibration, etc)

7.2 Example of batching

The following example uses a weighing module in slot 2 of the PLC.
It shows a batching application divided into steps as in the flowchart below.

```
                    ┌──────────────┐
                    │   Initial    │
                    └──────────────┘
                            ┆
                    ┌──────────────┐
                    │Send thresholds│
                    └──────────────┘
                            │
                    ┌──────────────┐
                    │     Tare     │
                    └──────────────┘
                            │
                    ┌──────────────┐
                    │Check batching│
                    └──────────────┘
                            ┆
                    ┌──────────────┐
                    │   continue   │
                    └──────────────┘
```
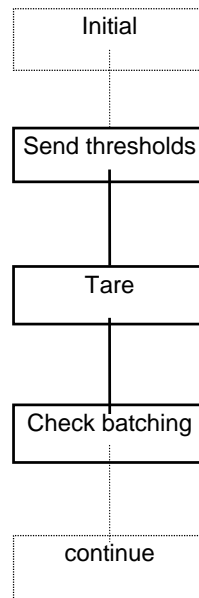
The program data used for the module:

%IW2.0.4:X0	Image of output Q0
%IW2.0.4:X1	Image of output Q1
%IW2.0.4:X5	Processing in progress indicator
%CH2.0	Data structure to send command
%MD2.0.8	High flow cut-off point Q0
%MD2.0.10	Low flow cut-off point Q1
%MW2.0:X1	Exchange in progress
%MW2.0:X2	Transmission in progress
%MW2.0.1:X1	Command accepted
%MW2.0.1:X2	Command accepted
%MW2.0.2:X2	Saturation of analog measurement system
%MW2.0.2:X7	Application fault
%MW2.0.3	Command order

```
Main Program
(* ///////// Send thresholds ////////////*)
%L100:
    IF NOT %M99 THEN
      JUMP %L120;
    END IF;

  (*Load and send thresholds *)
    IF RE %M99 THEN
      %MD2.0.8:=%MD230;(* High flow cut-off point Q0*)
      %MD2.0.10:=%MD232;    (* Low flow cut-off point Q1*)
      WRITE PARAM %CH2.0;JUMP %L120;
    END IF;

  (*Transmission in progress*)
    IF %MW2.0:X2 THEN
      JUMP %L120;
    END IF;

  (*command accepted*)
    IF NOT %MW2.0.1:X2 THEN
      RESET %M99;
    END IF;

  (*END INIT SCAN*)
    %L120:

(* //////// TARE PHASE      (%MW100 =4) ///////////// *)
%L260:
    IF %MW100<>4 THEN
      JUMP %L300;
    END IF;

  (*Tare request *)
    IF %M72 THEN
      RESET %M72;
      %MW270:2:=4;
    END IF;

  (*Command management *)
  SR8; (* %MW270  contains information on tare command type 4 *)

  (*Awaiting tare return*)
    IF %MW270=-1 AND %MW271=-1 THEN
      %MW100:=5;
      SET %M72;
      JUMP %L800;
    END IF;
```

```
(* ////////////// BATCHING PHASE     (%MW100 = 5) ////////// *)
%L300:
    IF %MW100<>5 THEN
      JUMP %L340;
    END IF;

  (*Validate thresholds *)
    IF %M72 THEN
      RESET %M72;
      %MW270:2:=8;
    END IF;

  (*Command management*)
    SR8;(*  %MW270  contains  information  on  Validate  thresholds
command type 8 *)

  (*Awaiting command return*)
    IF %MW270>=0 OR  %MW271>=0 THEN
      JUMP %L800;
    END IF;

  (*Check outputs to continue*)
    IF NOT %IW2.0.4:X0 AND NOT %IW2.0.4:X1 THEN
      %MW100:=6;
      SET %M72;
      JUMP %L800;
    END IF;

  (*PHASE 6      continue     *)
%L340:
    IF %MW100<>6 THEN
      JUMP %L380;
    END IF;

%L800:

SUBROUTINE SR8 :
  (* Send request for module*)
    IF %MW270>=0 THEN (* %MW270 contains information on order to be
executed  *)
      %M0:16:=0;
      SET %M0[%MW270];
      %MW2.0.3:=%M0:16;
      %MW271:=%MW270;
      %MW270:=-1;
      WRITE CMD %CH2.0;
      RET;
    END IF;

  (*Command in progress ? *)
    IF %MW2.0:X1 OR %IW2.0.4:X5 THEN
      RET;
    END IF;

  (*command accepted ? *)
    IF NOT %MW2.0.1:X1 AND NOT %MW2.0.2:X7 THEN
      %MW270:2:=-1;
    ELSE
      %MW270:=%MW271;
    END IF;
```

8.1 Technical characteristics

Weighing module	
Number of modules per PLC	The ISP Y100 is an intelligent module. The number of intelligent modules is limited to 2 for a TSX57-10 and 6 for a TSX57-20.
Number of weighers per module	1
Module power consumption	At 5V : 330 mA maximum At 24V : 130 mA maximum
Analog measurement system	
Electrical range	0 to 25 mV
Minimum measurable range	4.5 mV
Maximum measurable range	25 mV
Converter resolution	20 bits (1 048 576 pts)
Limitation on use	50 000 pts
Conversion speed	50 measurements/second
Zero drift	$< 0.2 \ \mu V/°C$
Gain drift	< 10 ppm/°C
Non linearity	< 20 ppm(PE)
Rejection in serial mode 50 Hz	> 120 dB
Maximum length of measurement cable	100m for a $0.4mm^2$ cable 200m for a $0.6mm^2$ cable (1 to 8 cells connected)
Cell powered by module	
Supply voltage	Continuous 10V
Load impedance	$> 43 \ \Omega$ (8 x 350 Ω cells)
Discrete outputs	
Number of channels	2
Nominal supply voltage	24 V
Isolation voltage	1500V rms
Maximum current	500 mA
Protection	Polarity inversion and short-circuit - against short-circuits - against inversions, via reverse diode Place a fuse on the + 24 V of the preactuators
Serial link	
Type	RS485 not isolated
Transmission speed	9600 bauds
Format	1 start bit, 8 data bits and 1 stop bit
Maximum permitted distance	100 meters maximum

8.2 Standards

Standards for TSX ISP Y100 module	
NF EN 45501	Yes
IEC 1131-2	Yes
Temperature	
Operating	from 0°C to 55°C
Storage	from 40°C to 70°C

Standards for TSX XBT H100 display unit	
NF EN 45501	Yes
IP65	Degree of protection conforms to IEC529 and NF C 20-010
Temperature	
Operating	from 0°C to 55°C
Storage	from 40°C to 70°C

8.3 Approvals

Approvals pending

8.4 Recommendations for installing an analog measurement system

Load distribution

The quality of the measurement provided by the module may be considerably reduced if the appropriate precautions for mounting and installing load cells are not observed. The following recommendations, while not intended to replace genuine expertise, will make you aware of certain precautions which need to be taken.

In an analog measurement system, the load cells can tolerate the following weights :
• the maximum weight to be measured (or maximum range),
• the weight of the load receiver and its structures (or meteorological tare).

This total weight is divided between 1, 2, 3, 4, 6, or even 8 cells. The design of the mechanical structures, the shape of the load receptacle and the load distribution on or in the receptacle all may lead to an uneven distribution of the total weight between the cells (except of course in the case of a single load cell).
The load cells must therefore be sized to be capable of tolerating the total weight (maximum range + tare) which they will have to support (see load cell selection guide).

Restrictions on the load receptacle

As the deflection of a load cell is very small (a few tenths of a millimeter), any restriction on the load receptacle or friction on the static framework will produce an error in the weight measurement and make it impossible to adjust the module correctly.

Mechanical mounting of the load cells

Load cells which are subject to traction or compression must be used vertically, observing the direction in which they act (traction or compression).
The maximum permitted tolerance for vertical mounting depends on the mounting and the required precision.

Protecting the load cells against electrical interference

It is recommended that each cell is equipped with a grounding strip to act as an electrical shunt and to protect the load cells against any currents which may be circulating in the metal framework (currents from the ground or solder point, electrostatic discharges, etc).
This strip must be long enough to avoid any mechanical restriction : it must be positioned in the immediate vicinity of the load cells, between the static framework and the load receptacle.

Splashing and corrosive products

The weighing cells are of dust and damp proof construction, however, it is recommended that they are protected against splashing, corrosive products and direct sunlight.

Preventive maintenance of the installation and accessories

The weighing module does not require any special maintenance. The weighing cells must however be cleaned periodically if they are used in hostile environments.
It is recommended that the load receptacle is checked and serviced periodically to ensure that it is in good mechanical order.

- Clean the receptacle and its structures as deposits of products or other materials may lead to significant variations in the tare.
- Check that the load cells are vertical.
- Check the condition of the cells and actuators depending on their length of service.
- Etc

Note:
Statistics show that 90% of malfunctions detected on weighing/batching installations can be attributed to the installation itself (defective limit switches, mechanical faults, etc) and not to the electronic control unit.

Metrology :
The science of weights and measures.

Calibration :
Graduates the measurement equipment.

Weighing instruments :
Measurement instruments used to determine the mass of an object through the action of its weight.
These instruments can also be used to determine other sizes, quantities, parameters or characteristics relating to weight.
Weighing instruments are classed as either non-automatic or automatic instruments depending on their type of operation.

Non-automatic weighing instruments :
Weighing instruments which require operator intervention during weighing operations, for example by placing the loads to be weighed on or off the load receptacle or reading the result. These instruments are used for direct observation of the result of the weighing by either displaying or printing it. Both possibilities are covered by the word "indication".

Load receptacle :
The part of the instrument designed to receive the load.

Indicator (of a weighing instrument) :
The part of the load measurement device which gives a direct reading of the result (TSX XBT H100).

Reset device :
The facility to reset the indicator to zero when there is no load on the load receptacle.

Tare device :
The facility to reset the instrument indication to zero when a load is placed on the load receptacle :
  - without affecting the extent of the weighing range of net loads (tare addition device), or
  - by reducing the extent of the weighing range of net loads (tare subtraction device, see ISP Y100).

Predefined tare device :
The facility to subtract a predefined tare value from a gross weight and indicate the calculated result. The weighing range is, therefore reduced.

Maximum range (Max) :
The maximum weighing capacity, without taking into account the added tare capacity.

Minimum range (Min) :
The load value below which weighing results may be adversely affected by significant relative error.

Weighing range :
The interval between the minimum and maximum ranges.

Load limit (Lim) :
The maximum static load which the instrument can withstand without permanently impairing its measurement accuracy.

Scale division :
The value, expressed in units of weight, of the difference between two consecutive numerical indications for a given value.

Gross value :
The indication of the weight of a load on an instrument when no tare facility or tare predefined device has been used.

Net value (N) :
The indication of the weight of a load on an instrument when a tare facility has been used.

Tare value (T) :
The value of the weight of a load determined by a tare weighing facility.
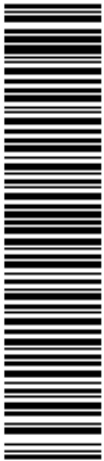
Predefined tare value (PT)
The numerical value representing a weight introduced into an instrument.
The word 'introduced' covers any procedure such as, for example, tabulation, data retrieval following storage or the introduction of the value via an interface.

Sealing :
The sealing of an appliance to meet legal requirements.

Language objects :
PLC variables : bits, words, etc.

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REF.
TSX DM ISP Y 100E

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Printed In France   Février 1998 (807)