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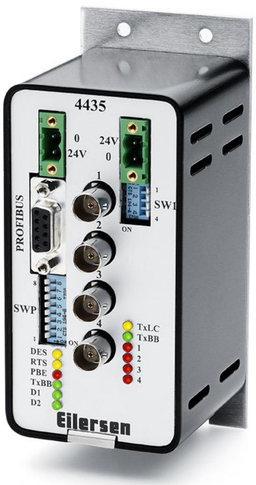
4X35 PROFIBUS-DP SYSTEM

Standard weight function for digital loadcells



Applies for:

Program no.: WEIGHT.051103.1

Document no.: 1103mu4X35-1a.DOC

Date: 2017-06-30

Rev.: 1a

1) CONTENTS

2) INTRODUCTION

2.1 Introduction

This document describes the use of a 4X35 Profibus-DP system unit from Eilersen Electric. The 4X35 system unit consists internally of a 4035 Profibus-DP module (with the program listed on the front page) and a 4040 communication module.

The 4X35 system unit is connected to X loadcells (1-4). With the program specified on the front page, the 4X35 Profibus-DP unit can act as a single system weight for up to 4 loadcells.

It is possible to connect the 4X35 Profibus-DP unit to a Profibus-DP network, where it will act as a slave. It will then be possible from the Profibus-DP master to read status, read system weight and perform commands such as zeroing and calibration.

Exchange of data between master and slave takes place as described in the following.

2.2 Profibus-DP specification

The Profibus-DP unit confirms to the following Profibus-DP specifications:

Protocol:	Profibus-DP
Communications form:	RS485
Module type:	Slave
Baud rates [kbit/sec]:	9.6, 19.2, 93.75, 187.5, 500, 1500, 3000, 6000, 12000
Profibus address:	0-127
Profibus connection:	9-pin sub-D (female) connector

2.3 Update times

The 4X35 Profibus-DP system unit samples the loadcell signals over a period of 200 mS. The hereby found loadcell signals are used in the Profibus-DP communication until new signals are achieved when the next sample period expires. Update times across the Profibus-DP communication depends on the specific Profibus-DP configuration (selected baudrate, number of slaves, scan times etc.).

3) DATA EXCHANGE

3.1 Profibus-DP communication using PPO

Profibus-DP communication with the 4X35 Profibus-DP unit uses a so called 'parameter-process data object' (PPO) consisting of 14 bytes. This object is used during reception as well as during transmission of data. The structure of this telegram is as follows:

PCV								PCD					
PCA		IND		PVA				CTW STW		MRV MAV			
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Byte 1 **Byte 14**

The telegram is made up of two blocks; a PCV part (the first 8 bytes) and a PCD part (the last 6 bytes). The two blocks are made up as follows:

PCV (Parameter-Characteristic-Value)
PCA (Bytes 1-2): Parameter Characteristics
IND (Bytes 3-4): Not used (reserved for future use)
PVA (Bytes 5-8): Parameter value

PCD (Process Data)
CTW (Bytes 9-10) (Master to Slave): Control Word
STW (Bytes 9-10) (Slave to Master): Status Word
MRV (Bytes 11-14) (Master to Slave): Main Reference Value
MAV (Bytes 11-14) (Slave to Master): Main Actual Value

In the following the meaning of the individual blocks in the telegram is described in detail.

The byte order (MSB/LSB first) for the individual parts is selected using jumper JU8, and upon factory delivery it is default set to MSB byte first.

The data format of the MAV part and parameters in the PVA part is 32 bit signed integer format (2’s complement). It is possible however, by using of jumper JU7 to change so that the MAV part and certain parameters in the PVA part are transferred in IEEE754 floating point format.

During transmission/reception of data consisting of several bytes (for example the MAV) it is up to the master (the PLC) to provide for consistent (belonging together) data.

3.2 PCV Description

The PCV part of the telegram is as mentioned made up of a PCA part, an IND part and a PVA part. As mentioned the IND part is not used, but the functionality of the other two parts of the PCV is described here.

PCA handling

The PCA part contains a RC part for 'request' and 'response' indication, and a PNU part for indication of parameter number. This is shown in the figure of the PCA block below.

Bit 15 **Bit 0**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
RC				TBD	PNU										

RC:	Request/Response Characteristics	(Values: 0..15)
TBD:	Not used	(Reserved for future use.)
PNU:	Parameter number	(Values: 0..999)

RC - Request/Response Characteristics

The RC part is used by the master to tell the slave (the weight) what 'requests' are wanted. Similarly the RC part is used by the slave to tell ('response') the master the status/results of the received 'requests'. The RC part further informs which other parts of the PCV (IND and PVA) are used.

The contents of the RC part has the following function during request:

REQUEST	**FUNCTION**
0	No request
1	Request parameter value
2	Change parameter value (2 bytes)
3	Change parameter value (4 bytes)
4-15	*Reserved for future use*

The contents of the RC part has the following function during response:

RESPONSE	**FUNCTION**
0	No response
1	Transfer parameter value (2 bytes)
2	Transfer parameter value (4 bytes)
3	Request refused (incl. Error#, see later)
4	Can not be serviced by PCV interface
5-15	*Reserved for future use*

PNU - Parameter number
Bit 10 to Bit 0 in the PCA part indicates the parameter number of the parameter to be read/changed. The individual parameters and their function is explained later.

PVA handling

The PVA part contains 4 bytes for reception and transmission of parameter values. The PVA part will transfer '2 byte' parameters in either bytes 7-8 (MSB first selected) or bytes 5-6 (LSB first selected). ‘4 byte’ parameters are transferred in bytes 5-8.
If the slave (the weight) refuses a request from the master the RC part will assume the value 3 (see above) and the actual error code will be transferred in the PVA element. The following error indications are possible:

ERROR#	**CAUSE**
0	Illegal PNU
1	*Reserved for future use*
2	Upper or lower limit is exceeded

3.3 PCD Description

As mentioned the PCD part of the telegram is made up of a CTW/STW part and a MRV/MAV part. The functionality of the PCD parts is described here. Note that the PCD part (the last 6 bytes) always transfers these data independent of the contents of the PCV part (the first 8 bytes).

CTW handling

During communication from the master to the slave (the weight) the first two bytes in the PCD part is used as a Control Word (CTW). By use of the Control Word (CTW) it is possible to tell the slave (the weight) how it should react, as different commands can be transferred to the weight.

The bit's in CTW have the following function:

BIT-NO	FUNCTION
0	*Reserved for future use*
1	**Zero system**.
2	**Calibrate corner**.
3	**Calibrate system**.
4	**Reset calibration**.
5-14	*Reserved for future use*
15	**Clear error in Error-register**.

If the **Zero system** bit is activated all loadcells and thereby the calculated system weight will be zeroed. This should only be done with an empty weighing arrangement.

If the **Calibrate corner** bit is activated the loadcell specified by the **Corner-register** will be calibrated to the weight indicated by the **Calibration load for corner/system** register.

If the **Calibrate system** bit is activated the system weight will be calibrated to the weight indicated by the **Calibration load for corner/system** register. Note that the individual calibration of the loadcells remains unchanged.

If the **Reset calibration** bit is activated all calibration factors (system and all loadcell factors) will be set to their standard value of 32768.

If the **Clear error in Error-register** bit is activated any error in the **Error-register** will be cleared.

STW handling

During communication from slave (the weight) to the master the first two bytes in the PCD part are used as a Status Word (STW). By reading the Status Word (STW) it is possible for the master to achieve information on the status of the slave (the weight). The functionality of the individual bits in the **Status Word** (STW) is described below:

BIT-NO	FUNCTION
0	**LC-error**.
1-3	*Reserved for future use*
4	**Zeroing OK**.
5	**Zeroing not possible**.
6	**Calibration OK**.
7	**Calibration not possible**.
8	**Reset Calibration OK.**
9	**Clear Error OK.**
10-14	*Reserved for future use*
15	**Error detected**.

If the **LC-error** bit is ON one or more loadcells detected at power up are in an error state. The actual error can be read in the **Status for loadcell X** register for the individual loadcell.

If the **Zeroing OK** bit is ON the last zero request has been performed. Note that the bit is cleared during the zero process and after the **Zero system** bit is cleared again.

If the **Zero not possible** bit is ON the last zero request has not been performed. The reason for this can be read in the **Zeroing-register**. Note that the bit is cleared during the zero process and after the **Zero system** bit is cleared again.

If the **Calibration OK** bit is ON the last calibration request has been performed. Note that the bit is cleared during the calibration process and after both the **Calibrate corner** and **Calibrate system** bits are cleared again.

If the **Calibration not possible** bit is ON the last calibration request has not been performed. The reason for this can be read in the **Calibration-register**. Note that the bit is cleared during the calibration process and after both the **Calibrate corner** and **Calibrate system** bits are cleared again.

If the **Reset calibration OK** bit is ON the last reset calibration request has been performed. Note that the bit is cleared during the process and after the **Reset calibration** bit is cleared again.

If the **Clear error OK** bit is ON the last clear error request has been performed. Note that the bit is cleared during the process and after the **Clear error in Error-register** bit is cleared again.

If the **Error detected** bit is ON the system has detected an error. The actual error can be found in the **Error-register**.

MRV handling

During communication from the master to the slave (the weight) the four last bytes in the PCD part are used as a **Main Reference Value** (MRV); a setpoint. The Main Reference Value (MRV) has no function in this program.

MAV handling

During communication from the slave (the weight) to the master the four last bytes in the PCD part are used as a **Main Actual Value** (MAV); the actual value. The Main Actual Value (MAV) is used to transfer the actual gross weight of the system. The gross weight must be scaled in accordance to the **Exponent for MAV** parameter (Par.No.=15) if *Gram mode* has **not** been selected using jumper JU1. Default factory setting is that *Gram mode* is **not** selected. Note that the MAV part may be transferred in 32 bit signed integer format (default) or in IEEE754 floating point format depending on the actual jumper setting.

4) PARAMETER LIST

4.1 Parameter list

A part from main values (MRV/MAV) and control/status word (CTW/STW), which are transferred at all times using the PCD part, it is possible to access the individual parameters one at a time using the PCV part. The following parameters can be read/updated using the PCV part:

NO	TYPE	PARAMETER
0	2 **R**	**LC-register** Bit register for indication of connected loadcells detected during power-up.
1	2 **RW**	**Corner-register** Indicates corner (loadcell number) to be corner calibrated.
2-6	*2*	*Reserved for future use*
7	2 **R**	**Error-register** Bit register for indication of detected errors.
8	2 **R**	**Zeroing-register** Bit register for indication of errors during zeroing.
9	2 **R**	**Calibration-register** Bit register for indication of errors during calibration.
10-14	*2*	*Reserved for future use*
15	2 **R**	**Exponent for MAV**
16 - 19 (20 - 31)	2 **R** (2 **R)**	**Exponent for loadcell 0 - 3** **(Exponent for loadcell 4 - 15)**
32 - 35 (36 – 47)	2 **R** (2 **R)**	**Status for loadcell 0 - 3** **(Status for loadcell 4 – 15)**
48 - 51 (52 – 63)	4 **R** (4 **R)**	**Actual gross weight for loadcell 0 - 3** **(Actual gross weight for loadcell 4 – 15)**
64 - 67 (68 – 79)	4 **R** (4 **R)**	**Actual signal for loadcell 0 - 3** **(Actual signal for loadcell 4 – 15)**
80* - 83* (84* - 95*)	4 **RW** (4 **RW)**	**Actual zero for loadcell 0 - 3** **(Actual zero for loadcell 4 – 15)**
96* - 99* (100* - 111*)	4 **RW** (4 **RW)**	**Corner calibration factor for loadcell 0 - 3** **(Corner calibration factor for loadcell 4 – 15)**
112*	4 **RW**	**Calibration factor for system**
113	4 **RW**	**Calibration load for corner/system**
114-127	*4*	*Reserved for future use*

Note that **NO** indicates the parameter number for the parameter in question.

Note that **TYPE** indicates the length of the parameter in question (2 = 2 bytes and 4 = 4 bytes). In addition after the length it is indicated whether its a read and write register (**RW** = **R**ead**W**rite) or its a read only register (**R** = **R**ead).

Note that data values are transferred as 2 complement signed values.

Note that a * after the parameter number indicates that the parameter in question is stored in the SEEPROM of the module, why this parameter can be remembered after power has been disconnected. Please note that no zeroing or calibration is performed at power-up.

5) PARAMETER DESCRIPTION

5.1 Parameter description

The individual parameters have the following functions:

LC-register is a bit register for indication of connected loadcells detected at power-up. Hence bit 0-15 will be ON, if the corresponding loadcell was detected during power-up..

Corner-register indicates which corner (loadcell number) that has to be corner calibrated. The loadcell number corresponds to the number on the front panel minus one (i.e. 0-3). Values in the interval 4-65535 indicate that the calibration corner is not selected.

Error-register is a bit register for indication of detected errors. The individual bits have the following function:

BIT-NO	**FUNCTION**
0	A checksum error for storage of zero and calibration in the SEEPROM of the module was detected during power-up.
1	A calibration factor was out of range during power-up (or scale is not calibrated).
2	A zero was invalid during power-up (or scale has not been zeroed).
3	Inconsistency between number of detected loadcells during power on and the number of loadcells indicated using Sw3.1-Sw3.4.
4-15	*Reserved for future use*

Zero-register is a bit register for indication of errors during zero. The individual bits have the following function:

BIT-NO	**FUNCTION**
0	**LC-error during zero** Check status for the individual loadcells.
1-15	*Reserved for future use*

Calibration-register is a bit register for indication of errors during calibration. The individual bits have the following function:

BIT-NO	FUNCTION
0	**LC-error during calibration** Check status for the individual loadcells.
1	**Calibration load not selected/valid** Check that a valid calibration load has been selected.
2	**Calibration corner not selected/valid** Check that a valid calibration corner has been selected.
3	**Calibration range exceeded** It was not possible to calibrate the system within the valid calibration range. Check that nothing is affecting the weighing arrangement mechanically. Check that the value in the **Calibration load for corner/system** register corresponds to the actual load.
4	**Gross weight was negative during calibration** Check the gross weight and whether it shows zero without any load.
5-15	*Reserved for future use*

Exponent for MAV is a register containing the exponent for the MAV. If *Gram mode* has **not** been selected using jumper JU1, the transferred gross weight has to be compared with this exponent. It indicates the "resolution" of the MAV (gross weight) as described under **Exponent for loadcell X**. The exponent corresponds to the smallest loadcell exponent.

Exponent for loadcell X is a register containing the exponent of loadcell **X**. The transferred weighing result has to be compared with the exponent for the loadcells. The exponent is a fixed value (2 complement) for a given loadcell, and it indicates the "resolution" of the loadcell (weighing result) as follows:

Exponent [Decimal]	Exponent [Hexadecimal]	Conversion factor to gram	SI unit
-3	0xFFFD	$*10^{-3}$	mg
-2	0xFFFE	$*10^{-2}$	
-1	0xFFFF	$*10^{-1}$	
0	0x0000	$*10^{0}$	gram
1	0x0001	$*10^{1}$	
2	0x0002	$*10^{2}$	
3	0x0003	$*10^{3}$	Kg
4	0x0004	$*10^{4}$	
5	0x0005	$*10^{5}$	
6	0x0006	$*10^{6}$	ton

Status for loadcell X is a register containing the actual status for loadcell **X**. The meaning of the status code can be found in the *STATUS CODES* chapter.

Actual gross weight for loadcell X contains the actual gross weight for loadcell **X**. The gross weight is the actual load signal for the loadcell adjusted by zero and calibration factor. Note that the value is a value averaged over 200 ms.

Actual signal for loadcell X contains the actual signal for loadcell **X**. The actual signal is the actual load signal for the loadcell without any adjustment fir zero and calibration factor. Note that the value is a value averaged over 200 ms.

Actual zero for loadcell X contains the actual zero value for loadcell **X**. The value is determined during zero from **Actual signal for loadcell X**.

Corner calibration factor for loadcell X contains the calibration factor for loadcell **X**. The value is determined during calibration of corner **X**, and lies in the interval 24576-40960 with 32768 as center value (standard calibration factor corresponding to no calibration).

Calibration factor for system contains the system calibration factor. The value is determined during calibration of the system, and lies in the interval 24576-40960 with 32768 as center value (standard calibration factor corresponding to no calibration).

Calibration load for corner/system must contain the load used during calibration of the system or corner. Note that this parameter is always transferred in the same format as the MAV. The format may vary depending on the actual jumper settings (MSB/LSB first, SI32/IEEE754 format and Standard/Gram mode).

6) DATA PROCESSING

6.1 Zeroing procedure

Zeroing of the system (all loadcells) should be done using the following procedure:

1) The weighing arrangement should be empty and clean.

2) The **Zero system** bit in the Control Word is activated. Note that zeroing is only done on the 0-1 transition.

3) By reading the **Zeroing OK** and the **Zeroing not possible** bits it is possible to read the result of the desired zeroing. If zeroing is not possible the reason can be read in the **Zeroing-register**.

It is always possible to read the achieved or used zero by reading from the parameter numbers where the loadcell zeroes are stored.

If in possession of a zero from a previous zeroing it is possible to insert this zero by writing to the parameter numbers where the loadcell zeroes are stored.

Note that no zeroing is performed at power-on.

6.2 Calibration procedure

Fine calibration of the system should be performed using the following procedure:

1) Check that the weighing arrangement is empty, and that the gross weight is zero. Zero if necessary.

2) Place a known load on the weighing arrangement.

3) Transfer the value for the known load to the **Calibration load for corner/system** register.

4) The **Calibrate system** bit in the Control Word is activated. Note that calibration is only done on the 0-1 transition.

5) By reading the **Calibration OK** and the **Calibration not possible** bits it is possible to read the result of the desired calibration. If calibration is not possible the reason can be read in the **Calibration-register**.

6) If **Calibration OK** is indicated the transferred gross weight should now match the used calibration load and the calibration factor has been updated. If **Calibration not possible** is indicated the system calibration factor is not changed.

If a corner calibration of the weighing arrangement is desired, the above listed procedure can still be used as the following is taken into account:

1) Corner calibration should be performed prior to system calibration. During corner calibration the **Calibration factor for system** should be set to its standard value of 32768.

2) Corner calibration is done one corner at a time, where the above listed procedure is used for each corner.

3) The actual calibration corner is selected in the **Corner-register** prior to start of corner calibration. The corner number corresponds to the loadcell number (on the front panel of the system unit) minus one (i.e. 0-3). If in doubt the loadcell number can be verified by finding the **Actual gross weight for loadcell X**, which gives a corresponding signal change when a load is placed/removed directly above the actual loadcell.

4) It is the **Calibrate corner** bit in the Control Word (CTW), that has to be activated and not the **Calibrate system** bit.

5) The used calibration load must be placed directly above the actual loadcell, so that it is this loadcell that absorbs the "entire" load.

6) It is not the system gross weight, that has to be observed but the **Actual gross weight for loadcell X**. If the other loadcells are completely unloaded, this value should correspond with the system gross weight.

7) Every corner calibration only changes the calibration factor for the corresponding corner. The other corner and system calibration factors remain unchanged.

It is always possible to read the achieved or used calibration factors by reading from the parameter numbers where the calibration factors are stored.

If in possession of calibration factors from a previous calibration, it is possible to insert these by writing to the parameter numbers where the calibration factors are stored.

Note that no calibration is performed at power-on.

7) INSTALATION OF SYSTEM

7.1 Checklist during installation

During installation of the system the following should be checked:

1) If necessary the Profibus-DP master should be configured to communicate with the 4X35 Profibus-DP system unit using the supplied GSD file. Please refer to appendix for tips using the supplied GSD file.

2) The loadcells are mounted mechanically and connected to BNC connectors in the front panel of the 4X35 system unit.

3) The 4X35 Profibus-DP system unit is connected to the Profibus-DP network using the Profibus-DP connector in the front panel of the 4X35 system unit. If necessary a possible termination of the Profibus-DP network is made at this Profibus-DP slave.

4) Use SW1 in the front panel of the 4X35 system unit to select any features specified in the separate manual for the 4040 communication module.

5) Use SWP.2-SWP.8 in the front panel of the 4X35 system unit to select the communication address of the 4X35 Profibus-DP system unit.

6) Power (24VDC) is applied at the 2 pole power connectors in the front panel of the 4X35 system unit as described in the hardware section, and the Profibus-DP communication is started.

7) Verify that the **PBE** lamp (red) is NOT lit, and that the **DES** lamp (yellow) and the **RTS** lamp (yellow) are lit/flashing.

8) Verify that the **TxLC** lamp (yellow) is lit (turns on after approx. 5 seconds).

9) Verify that the two **TxBB** lamps (green) are lit (both lit after 10 seconds).

10) Verify that NONE of the **1**, **2**, **3** or **4** lamps (red) are lit.

11) Verify that the 4X35 Profibus-DP system unit has found the correct loadcells (Par.No.=0), and that no loadcell error is indicated in the Status Word (STW).

12) Reset all calibration factors by using the Reset Calibration bit in the Control Word (CTW).

13) Zero the system weight with empty weighing arrangement by using the “Zeroing procedure” described earlier.

14) Verify that every loadcell gives a signal (Par.No.=48-63) by placing a load directly above each loadcell one after the other (possibly with a known load).

15) Place a known load on the weighing arrangement, and check that the system weight (MAV) corresponds to the load. Does the master take the exponent (scaling) into account if *Gram mode* has **not** been selected?

16) Zero the system weight with empty weighing arrangement by using the “Zeroing procedure” described earlier.

17) Place a known load (as close to maximum load as possible) on the weighing arrangement.

18) If the system weight deviates to much from the actual load a fine calibration of the system is made using the “Calibration procedure” described earlier.

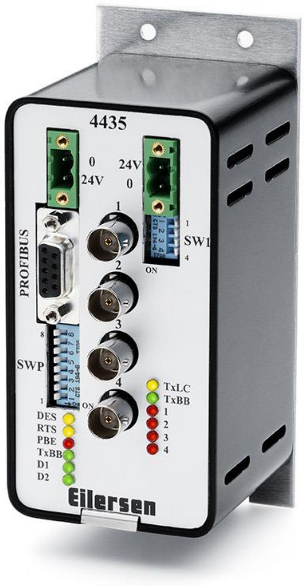
The system is now installed and a final check is made before the system is taken into usage. Possibly make a note of all zeroes (Par.No.=80-95) and calibration factors (Par.No,=96-112) for later use.

Note that in the above checklist no consideration has been made on which functions are implemented on the Profibus-DP master.

8) HARDWARE DESCRIPTION

8.1 4X35 overview

The following figure is an overview of a 4X35 system unit with 4 loadcell connections (i.e. a 4435 system unit):



8.2 4X35 front panel description

This chapter describes the connections, DIP-switch settings and lamp indications that are available on the front panel of the 4X35 system unit.

8.2.1 Connection of power

The 4X35 system unit is powered by applying +24VDC on the green two pole connectors (J2 and J3) as specified on the front panel of the 4X35 system unit. This powers the entire 4X35 system unit including the loadcells.

NOTE: If the loadcells are to be placed inside an EX area, then the 4X35 system unit itself **MUST** be placed outside the EX area, and the 4X35 system unit **MUST** be supplied as follows:

1) The 2 pole connector (J3), located to the right above the 4 pole DIP-switch block, **MUST** be powered by a 4051A power supply (+24VDC ATEX approved) from Eilersen Electric.

2) The 2 pole connector (J2), located to the left above the 9 pole Sub-D connector (PROFIBUS), **MUST** be powered by a separate +24VDC, that has **NO** connection to the ATEX approved +24VDC from the above mentioned 4051A power supply.

8.2.2 Connection of loadcells

The loadcells must be connected to the available BNC connectors in the front panel of the 4X35 system unit. The loadcells are connected starting with the connector marked 1 and continuing onwards in rising order. Thus if three loadcells are to be connected, they should be connected to the BNC connectors marked 1, 2 and 3.

8.2.3 Profibus-DP connector

The front panel of the 4X35 system unit is equipped with a nine pole female sub-D connector with a standard Profibus-DP interface. This allows for direct connection to a Profibus-DP network using standard Profibus-DP connectors. Termination of the Profibus should take place in the sub-D connector (male) of the cable. The specific terminals in the connector have the following function:

TERMINALS	FUNCTION
1	Not used
2	Not used
3	RS485-A (**positive** line) (Siemens designation: B line)
4	Request to Send (RTS)
5	0 VDC (Gnd)
6	+5VDC (Vout)
7	Not used
8	RS485-B (**negative** line) (Siemens designation: A line)
9	Not used

Note that some companies use different designations for the RS485-A and the RS485-B lines. Therefore the polarity of the lines has been listed.

8.2.4 SW1 settings

The front panel of the 4X35 system unit is equipped with a 4 pole DIP switch block named SW1. These switches are mounted on the 4040 communication module, and their functionality is described in the separate manual for the 4040 communication module. They are typically used for filter selection.

8.2.5 SWP settings

The front panel of the 4X35 system unit is equipped with a 8 pole DIP switch block named SWP. These switches allow setting of the Profibus-DP communication address of the 4X35 Profibus-DP system unit. This DIP switch block has the following function:

SWITCH	**FUNCTION**
SWP.1	*Reserved for future use*
SWP.2-SWP.8	**Selection of Profibus-DP communication address** The address is selected as the DIP-switches are binary coded, so SWP.2 is MSB and SWP.8 is LSB. Note that these switches are only read during power on.

8.2.6 Light Emitting Diodes (LEDs)

The front panel of the 4X35 system unit is equipped with a number of status lamps (light emitting diodes). These have the following functionality:

LED	**FUNCTION**
DES (Yellow)	**Data Exchange State** Exchange of data between 4X35 Profibus-DP slave and master.
RTS (Yellow)	**RtS signal (SPC3)** The 4X35 Profibus-DP system unit sends to the master.
PBE (Red)	**Profibus Error (when initializing the SPC3)** The 4X35 Profibus-DP system unit was not initialized correctly.
TxBB (Left) (Green)	**4035 communication with 4040 module (internal)** 4035 Profibus-DP module is transmitting to 4040 module.
D1 *(Green)*	*Reserved for future use*
D2 *(Green)*	*Reserved for future use*
TxLC (Yellow)	**4040 communication with loadcells** Please refer to the separate 4040 manual for further information.
TxBB (Right) (Green)	**4040 communication with 4035 Profibus-DP module (internal)** Please refer to the separate 4040 manual for further information.
1 (Red)	**Status for loadcell 1** Bad connection, loadcell not ready or other error detected.
2 (Red)	**Status for loadcell 2** Bad connection, loadcell not ready or other error detected.
3 (Red)	**Status for loadcell 3** Bad connection, loadcell not ready or other error detected.
4 (Red)	**Status for loadcell 4** Bad connection, loadcell not ready or other error detected.

8.3 Hardware Selftest

During power-on the 4X35 Profibus-DP system unit will perform a hardware selftest. The test will cause the light emitting diodes D1, D2 and PBE to turn on and off shortly, one at a time.

9) APPENDIX

9.1 4035 Profibus-DP module

This chapter describes possible connections, DIP-switch settings and jumper settings that are available internally on the 4035 Profibus-DP module. These will normally be set from Eilersen Electric and should only be changed in special situations.

9.1.1 SW3 settings

The 4035 Profibus-DP module is internally equipped with a 4 pole DIP switch block named SW3. This DIP switch block has the following function:

SWITCH	FUNCTION
Sw3.1-Sw3.4	**Expected number of loadcells** The expected number of loadcells is set as indicated below. **Note** that these switches are only read at power-up.

where the number of loadcells is indicated using Sw3.1-Sw3.4 as follows:

Sw3.1	Sw3.2	Sw3.3	Sw3.4	Number of loadcells
OFF	OFF	OFF	OFF	16
OFF	OFF	OFF	ON	1
OFF	OFF	ON	OFF	2
OFF	OFF	ON	ON	3
OFF	ON	OFF	OFF	4
OFF	ON	OFF	ON	5
OFF	ON	ON	OFF	6
OFF	ON	ON	ON	7
ON	OFF	OFF	OFF	8
ON	OFF	OFF	ON	9
ON	OFF	ON	OFF	10
ON	OFF	ON	ON	11
ON	ON	OFF	OFF	12
ON	ON	OFF	ON	13
ON	ON	ON	OFF	14
ON	ON	ON	ON	15

9.1.2 Jumper settings

The 4035 Profibus-DP module is internally equipped with 7 jumpers. These jumpers have these functions:

JUMPER	**FUNCTION**
JU1	**Selection of (Standard mode) / (Gram mode)** The jumper determines if certain weight indications in the telegram are in standard format (must be scaled according to the exponent) or directly in grams. OFF: *Standard mode* (normal setting from factory) ON: *Gram mode*
JU2-JU4	*Reserved for future use (termination)* *(normal default factory setting is OFF)*
JU6	*Reserved for future use* *(normal default factory setting is OFF)*
JU7	**Selection of (32 Bit Signed Integer) / (IEEE754) data format** The jumper determines if the weight indications in the telegram are in *32 bit signed integer* or in *IEEE754 floating point* format. OFF: *32 bit signed integer* format (normal setting from factory) ON: *IEEE754 floating point* format
JU8	**Selection of LSB/MSB data format** The jumper determines the byte order in which data are transmitted/received. OFF: LSB first ON: MSB first (normal setting from factory)

9.1.3 JTAG connector

The 4035 Profibus-DP module is internally equipped with a JTAG connector. The connector (J5) is used exclusively by Eilersen Electric A/S for download of new software.

9.2 4040 communication module

For information on jumper settings, DIP-switch settings, LED status lamps etc. on the 4040 communication module that is not covered in the above, please refer to the separate documentation, that describes the 4040 communication module and its specific software.

9.3 Status codes

Status codes for the connected loadcells are shown as a 4 digit hex number. If more than one error condition is present the error codes are OR'ed together. Note that the table below is a list of error codes that normally can appear, but that other error codes are possible. In such a case please refer to the documentation for the actual used 4040 program.

CODE (Hex)	CAUSE
0001	*Reserved for future use*
0002	*Reserved for future use*
0004	*Reserved for future use*
0008	*Reserved for future use*
0010	**Power failure** Supply voltage to loadcells is to low.
0020	**New loadcell detected or loadcells swapped** Power the system off and back on. Then verify that all parameters are acceptable.
0040	**No answer from loadcell** Bad connection between loadcell and loadcell module? Bad connection between loadcell module and communication module?
0080	**No answer from loadcell** Bad connection between communication module and Beebus master?
0100	*Reserved for future use*
0200	*Reserved for future use*
0400	*Reserved for future use*
0800	**No loadcell answer** Bad connection between loadcell and loadcell module? Bad connection between loadcell module and communication module? Bad connection between communication module and Beebus master? Bad setting of DIP switches on loadcell or communication module?
1000	*Reserved for future use*
2000	*Reserved for future use*
4000	*Reserved for future use*
8000	*Reserved for future use*

9.4 Data formats

The Profibus-DP communication can transfer data in the following three data formats. If necessary please refer to other literature for further information on these formats.

9.4.1 Unsigned integer format (16 bit)

The following are examples of decimal numbers represented on 16 bit unsigned integer format:

Decimal	Hexadecimal	Binary (MSB first)
0	0x0000	00000000 00000000
1	0x0001	00000000 00000001
2	0x0002	00000000 00000010
200	0x00C8	00000000 11001000
2000	0x07D0	00000111 11010000
20000	0x4E20	01001110 00100000

9.4.2 Signed integer format (32 bit)

The following are examples of decimal numbers represented on 32 bit signed integer format:

Decimal	Hexadecimal	Binary (MSB first)
-20000000	0xFECED300	11111110 11001110 11010011 00000000
-2000000	0xFFE17B80	11111111 11100001 01111011 10000000
-200000	0xFFFCF2C0	11111111 11111100 11110010 11000000
-20000	0xFFFFB1E0	11111111 11111111 10110001 11100000
-2000	0xFFFFF830	11111111 11111111 11111000 00110000
-200	0xFFFFFF38	11111111 11111111 11111111 00111000
-2	0xFFFFFFFE	11111111 11111111 11111111 11111110
-1	0xFFFFFFFF	11111111 11111111 11111111 11111111
0	0x00000000	00000000 00000000 00000000 00000000
1	0x00000001	00000000 00000000 00000000 00000001
2	0x00000002	00000000 00000000 00000000 00000010
200	0x000000C8	00000000 00000000 00000000 11001000
2000	0x000007D0	00000000 00000000 00000111 11010000
20000	0x00004E20	00000000 00000000 01001110 00100000
200000	0x00030D40	00000000 00000011 00001101 01000000
2000000	0x001E8480	00000000 00011110 10000100 10000000
20000000	0x01312D00	00000001 00110001 00101101 00000000

9.4.3 IEEE754 floating point format (32 bit)

Representation of data on IEEE754 floating point format is done as follows:

Byte1		Byte2		Byte3	Byte4
bit7	bit6 bit0	bit7	bit6 bit0	bit7 bit0	bit7 bit0
S	2^7 …..…. 2^1	2^0	2^{-1} ……... 2^{-7}	2^{-8} …………..... 2^{-15}	2^{-16} ………..…. 2^{-23}
Sign	Exponent		Mantissa	Mantissa	Mantissa

Formula:

$$\text{Value} = (-1)^S * 2^{(\text{exponent}-127)} * (\text{I}+\text{Mantissa})$$

Example:

Byte1	Byte2	Byte3	Byte4
0100 0000	1111 0000	0000 0000	0000 0000

$$\text{Value} = (-1)^0 * 2^{(129-127)} * (1 + 2^{-1} + 2^{-2} + 2^{-3}) = 7.5$$

Please note that if transfer of MSB first has been selected (default setting), the byte with the “sign” will come first in the weight indications, and if LSB first has been selected the byte with the “sign” will come last in the weight indications.

10) APPENDIX – PROFIBUS CONFIGURATION TIPS

10.1 GSD File

The supplied GSD file can be used to configure the PROFIBUS master (PLC) to communicate with the 4x35 PROFIBUS unit.

When configuring the PROFIBUS master using the supplied GSD file please note the following tips.

10.1.1 Input/Output modules and data sizes

The amount of data exchanged between the PROFIBUS master and the 4x35 PROFIBUS unit is specified in the supplied GSD file.

The supplied GSD file for this application (see front page of this manual) specifies the input and output modules to be used as follows:

```
;---------------------------------------------------------------------
; Modules for the 4x35
;---------------------------------------------------------------------
Module= "14 Byte DI" 0x1D
EndModule
Module= "14 Byte DO" 0x2D
EndModule
```

The PROFIBUS master must be configured from the PROFIBUS configuration tool EXACTLY as follows:

1) First select one (and ONLY one) universal INPUT module of the above type specifying "**14 Byte DI**".
2) Then select one (and ONLY one) universal OUTPUT module of the above type specifying "**14 Byte DO**".
3) Do NOT use any other kind of modules when configuring the PROFIBUS master.

This should configure the system to use 14 input bytes and 14 output bytes, corresponding to the figure shown previously.

NOTE: Please beware that the terms "input" and "output" may be confusing and are used differently from vendor to vendor. Throughout this manual, these terms are always from the PROFIBUS masters (PLC's) point of view. Therefore, the data from the 4x35 unit to the PLC are referred to as "input" data, while the data from the PLC to the 4x35 unit are referred to as "output" data.